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(71) Applicant: MOTOROLA INC. [US/US]; 1303 East Algonquin Road, Schaumburg, IL 60196 (US).

(72) Inventors: HUFFMAN, James, R.; 4 Stegner Lane, Austin, TX 78746 (US). VAN MYERS, Jeffrey; P.O. Box 130, Driftwood, TX 78619 (US). HUANG, Yee, Wei; 9501 Scenic Bluff Drive, Austin, TX 78733 (US).

(74) Agents: INGRASSIA, Vincent, B. et al.; Motorola Inc., Intellectual Property Dept., P.O. Box 10219, Scottsdale, AZ 85271-0219 (US).

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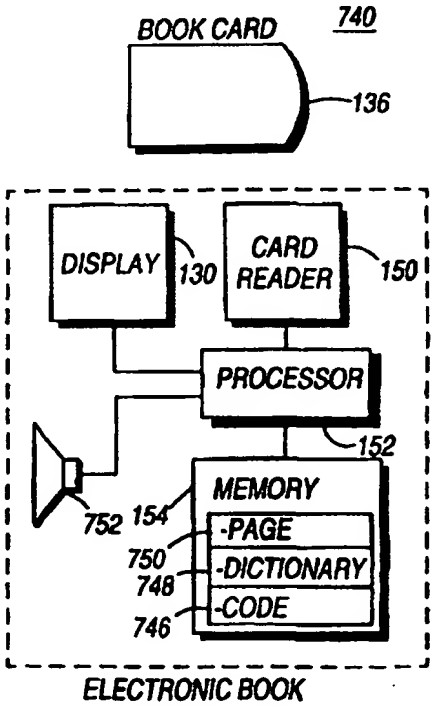
(54) Title: APPARATUS AND METHOD FOR STORING AND PRESENTING TEXT

(57) Abstract

An apparatus (740) for presenting stored text has a book card (136). The book card (136) contains a number of pointers (744) and a compression code (746). An interface (150) receives the book card (136). An internal memory (154) has a permanent dictionary (748) that contains a number of words. A processor (152) is in communication with the interface (150), the internal memory (154) and a display (130). The processor (152) displays a subset of the words, based upon the pointers (744), on the display (130).



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APPARATUS AND METHOD FOR STORING AND PRESENTING TEXT

Related Invention

The present invention is related to the following invention which is assigned to the same assignee as the present invention:

"System and Method for Limiting Access to a Book Card", having Serial No. 08/572,346, filed December 14, 1995.

"Method and Electronic Book for Creating a Plurality of Versions of a Book", having Serial No. 08/572,485, filed December 14, 1995.

"Electronic Book Diary and Method For Use Therefore", having Serial No. 08/572,602, filed December 14, 1995.

"Method and Device for Inhibiting the Operation of an Electronic Device During Take-Off and Landing of an Aircraft", having Serial No. 08/572,603, filed December 14, 1995.

"System for Inhibiting the Operation of an Electronic Device During Take-Off and Landing of an Aircraft", having Serial No. 08/572,484, filed December 14, 1995.

"Method for Abridging Text", having Serial No. 08/572,834, filed December 14, 1995.

"A Method of Substituting Names in an Electronic Book", having Serial No. 08/572,480, filed December 14, 1995.

"System and Method of Authoring Tools for an Electronic Book", having Serial No. 08/572,358, filed December 14, 1995.

"System and Method for an Automatic Library for a Plurality of Book Cards", having Serial No. 08/572,482, filed December 14, 1995.

"Electronic Book and Method of Selecting a Primary Font and a Primary Size for Displaying Text Therewith", having Serial No. 08/572,407, filed December 14, 1995.

"Electronic Book and Graphical User Interface for Selecting a Book to Read Therewith", having Serial No. 08/572,406, filed December 14, 1995.

"Electronic Book and Graphical User Interface to Provide Control Thereof", having Serial No. 08/572,403, filed December 14, 1995.

"Electronic Book and Method of Storing at Least One Book in an Internal Machine-Readable Storage Medium", having Serial No. 08/572,593, filed December 14, 1995.

"Electronic Book and Method of Annotation Therefor", having Serial No. 08/572,367, filed December 14, 1995.

"Electronic Book and a Method of Displaying a Relative Position of a Current Page of a Book Therefor", having Serial No. 08/572,373, filed December 14, 1995.

"Method and System for Encoding a Book for Reading Using an Electronic Book", having Serial No. 08/572,468, filed December 14, 1995.

"Electronic Book and Method of Displaying an Animated Page Turn Therefor", having Serial No. 08/572,405, filed December 14, 1995.

"Electronic Book and Method of Controlling a Rate of Information Displayed Thereby", having Serial No. 08/572,372, filed December 14, 1995.

"Reusable Housing and Memory Card Therefor", having Serial No. 08/572,413, filed December 14, 1995.

"Electronic Book and Method of Displaying at Least One Reading Metric Therefor", having Serial No. 08/572,842, filed December 14, 1995.

"Electronic Book and Method of Creating a Personal Log of Reading Activity Therefor", having Serial No. 08/572,456, filed December 14, 1995.

"Electronic Book Having Highlighting Feature", having Serial No. 08/572,469, filed December 14, 1995.

"Electronic Book and Method of Capturing and Storing a Quote Therein", having Serial No. 08/572,601, filed December 14, 1995.

The subject matter of the above-identified related inventions are hereby incorporated by reference into the disclosure of this invention.

Field of the Invention

Field of the Invention

The present invention relates generally to the field of electronic information devices and more particularly to an apparatus and method for storing and presenting text.

Background of the Invention

Various types of hand-held electronic reading devices have been proposed to electronically display textual information for reading by a user. A typical hand-held electronic reading device includes a display device to display the textual information and a user interface which allows a user to navigate through the textual information and access various features of the electronic reading device. The display device and the user interface are incorporated in a hand-held housing to facilitate portability of the electronic reading device.

Many hand-held electronic reading devices have a user interface in the form of one or more external buttons. The buttons are depress in a predetermined manner either to navigate through the textual information or to access various features of the device. However, many hand-held electronic reading devices implement the user interface in a manner which does not provide a simple intuitive, or efficient method for navigating the textual information or for accessing the features.

The lack of simplicity of using current hand-held electronic reading devices along with the lack of comfort in handling many of these devices result in some people preferring to read a real paper book rather than using a hand-held electronic reading device. Further, current hand-held electronic devices use bulky storage devices and methods of storing text for display.

Brief Description of the Drawings

The invention is pointed out with particularity in the appended claims. However, other features of the invention will become more apparent and the invention will be best understood by referring to

the following detailed description in conjunction with the accompanying drawings in which:

FIG. 1 is a view of an embodiment of an electronic book in a closed position;

FIG. 2 is a view of the embodiment of the electronic book of FIG. 1 in an open position;

FIG. 3 is a block diagram of an embodiment of the electronic book;

FIG. 4 is an illustration of various hot spot locations used to provide control of the electronic book to a user;

FIG. 5 is an illustration of a library screen display using an embodiment of the electronic book;

FIG. 6 is an illustration of a user-initiated event to open the desired book from the library screen;

FIG. 7 is an illustration of a first page of a book displayed on an embodiment of the electronic book;

FIG. 8 is an illustration of a title page of a book displayed on an embodiment of the electronic book;

FIG. 9 is an illustration of a font selection page displayed on an embodiment of the electronic book;

FIG. 10 is an illustration of the title page of the book which is displayed upon exiting the font selection page;

FIG. 11 is an illustration of a system control page displayed in an embodiment of the electronic book;

FIG. 12 is an illustration of the title page of the book which is displayed upon exiting the system control page;

FIG. 13 is an illustration of the title page of the book wherein a radio frequency link option is selected;

FIG. 14 is an illustration of the title page of the book wherein a pacing control option is selected by a user;

FIG. 15 is an illustration of a pacing control page displayed in an embodiment of the electronic book;

FIG. 16 is an illustration of the title page of the book which depicts other user–initiated options;

FIG. 17 is an illustration of a page marked by a dog ear for use in embodiments of the electronic book;

FIG. 18 is an illustration of a dog ear dialog box used in embodiments of the electronic book;

FIG. 19 is an illustration of a user selecting a portion of a page of text;

FIG. 20 is an illustration of an option selection dialog box used in embodiments of the electronic book;

FIG. 21 is an illustration of an annotation display used in embodiments of the electronic book;

FIG. 22 is an illustration of a marker used to indicate that a page has an annotation associated therewith;

FIG. 23 is an illustration of a user selecting a set bookmark option in the option selection dialog box;

FIG. 24 is an illustration of the page of FIG. 23 having a bookmark displayed thereon;

FIG. 25 is a flow diagram of an event loop performed in an embodiment of the electronic book;

FIG. 26 is a flow diagram of steps performed in an embodiment of a library graphical user interface routine for use in the electronic book;

FIGs. 27 and 28 show flow diagrams of an embodiment of the routine to display pages of text in the electronic book;

FIG. 29 is a flow diagram of steps performed to display a current page in the electronic book;

FIG. 30 is a flow diagram of steps performed in an embodiment of an annotation subroutine;

FIG. 31 is a flow diagram of steps performed in an embodiment of a quote capture subroutine;

FIG. 32 is a flow diagram of steps performed in an embodiment of a dog ear subroutine;

FIG. 33 is a flow diagram of steps performed in an embodiment of a pacing control subroutine;

FIG. 34 is a flow diagram of steps performed in an embodiment of the font selection subroutine; and

FIG. 35 is a flow diagram of steps performed in an embodiment of the system control subroutine;

FIG. 36 is a flow chart of an embodiment of the steps used to store text;

FIG. 37 is a flow chart of an embodiment of the steps used to store text;

FIG. 38 is a block diagram of an embodiment of the electronic book;

FIG. 39 is a schematic diagram of an embodiment of a book card;

FIG. 40 is a schematic representation of an embodiment of a permanent dictionary;

FIG. 41 is a schematic representation of an embodiment of a page memory;

FIG. 42 is a block diagram of an embodiment of a speech synthesis circuitry; and

FIG. 43 is a flow chart of an embodiment of the steps used to display text.

Detailed Description of the Drawings

FIG. 1 is a view of an embodiment of an electronic book in a closed position. The electronic book has a book-shaped housing 100 having the look and feel of a real, paper book. The book-shaped housing 100 has a first housing member 102 pivotably connected to a second housing member 104 to facilitate opening and closing in a book-like manner. The first housing member is partially formed by a book-like, front cover member 106. In a similar manner, the second housing member 104 is partially formed by a book-like, back cover member 108. The front cover member 106 and the back cover member 108 are pivotably connected by a spine member 110.

To better provide the look and feel of a real book, the front cover member 106 and the back cover member 108 have an exterior made of a material used in real book covers. Examples of such a material include, but are not limited to, leather, simulated leather, vinyl, and a woven fabric such as cotton. The exterior can either be permanently affixed to the front cover member 106 and the back cover member 108, or be in the form of a removable jacket.

In addition to the front cover member 106, the first housing member 102 is partially defined by an enclosure 112. Similarly, the second housing member 104 is partially defined by an enclosure 114 in addition to the back cover member 108. When the electronic book

is in the closed position, the enclosure 112 and the enclosure 114 have an external appearance of edges of pages of a real, paper book. In particular, the enclosures 112 and 114 define a top edge 116, a bottom edge 118, and a foredge 120 which appear as the top edge, the bottom edge, and the foredge, respectively, of a real, paper book. The top edge 116, the bottom edge 118, and the foredge 120 are recessed with respect to the front cover member 106 and the back cover member 108.

FIG. 2 is a view of the embodiment of the electronic book of FIG. 1 in an open position. It is preferred that the first housing member 102 and the second housing member 104 be substantially symmetric so that the front cover member 106, the back cover member 108, and the spine member 110 rest substantially flat on a flat surface in the open position. The substantial symmetry makes the electronic book feel like a real, paper book being opened to one of its middle pages. As a result, the electronic book can be comfortably held and read in a manner consistent with a paper book.

A touchscreen 130 is integrated in the book-shaped housing 100 to be accessible when the book-shaped housing 100 is opened in the book-like manner. In the embodiment illustrated in FIG. 2, the touchscreen 130 is integrated with the enclosure 114 of the second housing member 104. Optionally, a second touchscreen 132 can also be integrated in the book-shaped housing. As illustrated, the second touchscreen 132 can be integrated with the enclosure 112 of the first housing member 102.

The touchscreen 130 and the second touchscreen 132 each include a touch-sensitive panel over a display device. Behind the display device can be a backlighting element.

The touchscreen 130 and the second touchscreen 132 may provide either a color display or a monochrome display depending on a particular model of the electronic book. To provide their touch sensitivity, the touchscreen 130 and the second touchscreen 132 can utilize analog resistive technology as is known in the art. It is noted, however, that other technologies for providing touch sensitivity can also be utilized.

It is preferred that the touchscreen 130 and the second touchscreen 132 be capable of providing backlighting to allow use of

the electronic book in poorly–lit or dimly–lit environments. More preferably, the touchscreen 130 is capable of backlighting selected portions or subsets of the entire touchscreen 130. Here, the electronic book can provide a power–saving mode wherein only a portion of the touchscreen 130 being viewed by a user is actively backlit.

The book–shaped housing includes a receiving slot 134 which physically receives a removable machine–readable storage medium 136. The removable machine–readable storage medium 136 contains machine–readable data representative of text from a book. Optionally, the machine–readable data is also representative of graphical information within the book. It is noted that the term "book" should be construed broadly as any written or printed composition having textual information which is read by an individual. Hence, the term "book" should be inclusive of books, magazines, newspapers, or the like.

The text and the graphical information contained in the removable machine–readable storage medium 136 are displayed on the touchscreen 130. The second touchscreen 132 can be included to display graphical information while the touchscreen 130 displays text. As another option, the touchscreen 130 and the second touchscreen 132 can display neighboring pages of the book. Further, the touchscreen 130 and the second touchscreen 132 can be utilized to simultaneously view two books. The second touchscreen 132 can also be utilized in a second level operating system, which is herein called an advanced reader graphical user interface. The functionality of the second touchscreen 132 can be selected by the user using a switch or the advanced reader graphical user interface in the electronic book.

It is noted that there are a number of ways to encode the text and the graphical information within the book for storage on the removable machine–readable storage medium 136. In one embodiment, the removable machine–readable storage medium 136 contains a series of pointers which point to words contained in a dictionary within the electronic book. Words which are not contained in the dictionary are located in a customized dictionary on the removable machine–readable storage medium 136. In this way, the words to be presented on the touchscreen 130 are selected with

minimal storage requirements in the removable machine–readable storage medium 136.

Preferably, the removable machine–readable storage medium 136 is in the form of either a smart card or a PCMCIA card. Here, the receiving slot 134 is shaped to receive either a smart card or a PCMCIA card.

The book–shaped housing 100 further defines a power–receiving port 138 and a data–receiving port 140. The power–receiving port 138 receives a plug or other type of connector to supply power to the electronic book. Power supplied to the electronic book via the power receiving port 138 can be used to directly operate the electronic book or to recharge batteries internal to the electronic book. In one embodiment of the electronic book, the spine member 110 is shaped to receive a combination of battery cells which can be recharged via the power–receiving port 138. If the second touchscreen 132 is not used, the enclosure 112 of the first housing member 102 can be used to store extra batteries and/or extra book cards.

The data port 140 is utilized to communicate signals representative of machine–readable data between the electronic book and an external device. The data port 140 can be used, for example, to receive machine–readable data signals representative of text and graphics in a book from the external device for storage in the electronic book. In this manner, the data port 140 provides an alternative to the receiving slot 134 for receiving text and graphics of a book. Additionally, the data port 140 can be utilized to transmit machine–readable data contained within the electronic book to the external device.

Preferably, the electronic book is automatically activated (i.e., automatically turns on) when in the open position, and is automatically deactivated (i.e. automatically turns off) when in the closed position. To this end, the electronic book can include a magnet 142 incorporated within one of the first housing member 102 or the second housing member, and a reed switch 144 incorporated within the other housing member. When the electronic book is in the closed position, the magnet 142 is proximate to the reed switch 144. The magnetic field generated by the magnet 142 causes the reed switch 144 to assume a first switch position which deactivates the electronic

book. When the electronic book is in the open position, the magnet 142 is distant from the reed switch 144. In absence of a significant magnetic field, the reed switch 144 returns to a second switch position which activates the electronic book.

It is noted that in alternative embodiments, the electronic book is activated and deactivated by an external switch or button (not specifically illustrated) rather than by the reed switch 144.

FIG. 3 is a block diagram of an embodiment of the electronic book. An interface 150 receives the removable machine–readable storage medium 136 containing machine–readable data representative of text and graphics from a book. In a preferred embodiment of the present invention, the interface 150 comprises a PCMCIA interface which receives a removable machine–readable storage medium in the form of a PCMCIA card. Physically, the interface 150 is proximate to the receiving slot 134 illustrated in FIG. 2.

In general, it is preferred that the interface 150 be capable of receiving an external device other than a machine–readable storage medium. Further, it is preferred that the interface 150 be capable of receiving a plurality of external devices. To these ends, the interface 150 can comprise a plurality of similar interfaces, such as a plurality of PCMCIA interfaces. Here, the electronic book can simultaneously receive two or more of a PCMCIA memory card, a PCMCIA modem, or another PCMCIA device.

A processor 152 is in communication with the interface 150 to read the machine–readable data from the removable machine–readable storage medium 136. The processor 152 can be in the form of a microprocessor, a custom integrated circuit, an application specific integrated circuit, or a programmable logic array, for example. Physically, the processor 152 is housed within the book–shaped housing 100.

The touchscreen 130 is in communication with the processor 152 to display a page of the text and/or the graphics represented by the machine–readable data. Further, the touchscreen 130 acts as an input device to receive user–initiated events, i.e. user–initiated actions, and communicate these user–initiated events or actions to the processor 152.

An internal machine–readable storage medium 154 is in communication with the processor 152 to support a number of operative features of the electronic book. The internal machine–readable storage medium 154 can include one or more memory devices, such as a random access memory, a read–only memory, and/or an electronically erasable and programmable read–only memory (EEPROM).

A computer program or other form of software or firmware is stored in the internal machine–readable storage medium 154. The computer program directs the processor 152 to support the operative features of the electronic book. Preferably, the computer program includes an event loop that processes and responds to user–initiated events and actions. More specifically, received events are placed in an event queue in the internal machine–readable storage medium 154. Each of the received events is processed and removed from the event queue. As a result, a user can initiate a number of events or actions without having to wait for previous actions to be processed.

The internal machine–readable storage medium 154 can also include a dictionary to which pointers stored in the removable machine–readable storage medium 136 point. By including the dictionary within the electronic book, less storage space is required on the removable machine–readable storage medium 136 to store the text from the book.

Further, the internal machine–readable storage medium 154 can contain machine–readable data representative of text and graphics from a book. Here, the processor 152 reads the machine–readable data from the internal machine–readable storage medium 154 and commands the touchscreen 130 to display pages of the text and graphics.

Signals are communicated between the electronic book and an external device via either a data interface 156 in communication with the processor 152, via an antenna 158 and a radio frequency modem 160 in communication with the processor 152, or via an infrared transceiver 161 in communication with the processor. As another option, communication between the electronic book and the external device can be effectuated using either a smart communication card or a PCMCIA communication card received by the interface 150. Here, a

PCMCIA modem card or a PCMCIA infrared transceiver card can be utilized, for example, for external communication.

Optionally, a voice synthesizer 162 is included in the electronic book to provide a spoken auditory display of pages of the text read from either the removable machine–readable storage medium 136 or the internal machine–readable storage medium 154. In one embodiment, the processor 152 directly converts the text from the book into speech signals for the voice synthesizer 162. Optionally, control codes can be provided within the removable machine–readable storage medium 136 to allow words to be pronounced or emphasized in different ways. Further, the control codes can command the words to be spoken in either a male voice, a female voice, or a child's voice. The synthesized voice can be sampled (such as using the user's voice) or can be a computer-synthesized voice.

As an alternative, a custom voice dictionary can be provided to augment a general voice dictionary stored in the electronic book. The customized voice dictionary can be used for alternative pronunciations, voices, and emphasis.

The voice synthesizer 162 is either permanently integrated in the electronic book or is a removable accessory. To facilitate removability, the voice synthesizer 162 can be embodied within a smart card or a PCMCIA card for reception by the interface 150. Alternatively, the voice synthesizer 162 can communicate with the processor 152 via an accessory interface bus 163. In a similar manner, the RF modem 160 and/or the second touchscreen 132 can communicate with the processor 152 via the accessory interface bus 163.

Before giving a detailed description of steps performed by the elements of FIG. 3 for the various embodiments of the present invention, a functional description of a particular embodiment of the electronic book will now be described. This embodiment is based on a single touchscreen, namely the touchscreen 130, to display the text and the graphics of the book and to allow a user to control the electronic book. It is noted, however, that the teachings herein can also be applied to a dual touchscreen embodiment which further includes the second touchscreen 132. Furthermore, it is noted that the teachings herein are not limited to the use of a touchscreen, and

hence, can be applied to an electronic book containing any type of display device (such as a liquid crystal display or a cathode ray tube, for example) and any type of input device (such as a series of buttons, a mouse, a trackball, a lightpen, or a touchpad, for example).

FIG. 4 is an illustration of various hot spot locations used to provide control of the electronic book to a user. A page of the text represented by the machine-readable data read from either the removable machine-readable storage medium 136 or the internal machine-readable storage medium 154 is displayed on a display portion 168 of the touchscreen 130. The display portion 168 is also utilized to display graphics represented by the machine-readable data.

A first hot spot portion 170 of the touchscreen 130 is designated for receiving a predetermined user-initiated event which requests that a subsequent page of the text be displayed on the touchscreen 130. Hence, the first hot spot portion 170 can be synonymously referred to as an "advance page portion" or an "advance page hot spot" for receiving an advance page event. In the embodiment illustrated in FIG. 4, the first hot spot portion 170 includes a top margin portion 172, a side margin portion 174, and a bottom margin portion 176 of the touchscreen 130. The top margin portion 172 is located above the display portion 168, the side margin portion 174 is located beside the display portion 168, and the bottom margin portion 176 is located below the display portion 168.

A second hot spot portion 178 of the touchscreen 130 is designated for receiving a predetermined user-initiated event which requests that a previous page of the text be displayed. Hence, the second hot spot portion 178 can be synonymously referred to as a "page back portion" or a "page back hot spot" for receiving a page back event. In the embodiment illustrated in FIG. 4, the second hot spot portion 178 is located beside the display portion 168 of the touchscreen 130 and opposite the side margin portion 174.

A third hot spot portion 180 of the touchscreen 130 is designated for receiving a predetermined user-initiated event which requests that a pre-marked page be displayed on the touchscreen 130. In the embodiment of FIG. 4, the third hot spot portion 180 is located in an upper portion of the touchscreen 130 and is shaped as a

bookmark graphic 182. Hence, the third hot spot portion 180 can be synonymously referred to as a "bookmark portion" or a "bookmark hot spot".

A fourth hot spot portion 184 of the touchscreen 130 is designated for receiving a predetermined user–initiated event to close the current book being read and to request that a library screen be displayed on the touchscreen 130. The library screen is utilized by a user to select a book to read from a plurality of books within a library. Hence, the fourth hot spot portion 184 can be synonymously referred to as a "close book portion" or a "close book hot spot" for receiving a close book event.

A fifth hot spot portion 186 of the touchscreen 130 is designated for receiving a predetermined user–initiated event which requests that the displayed page be marked. In the embodiment of FIG. 4, the fifth hot spot portion 186 is located in an upper corner of the touchscreen 130. In this embodiment, the fifth hot spot portion 186 of the touchscreen 130 is utilized for dog–earring pages of the book. Hence, the fifth hot spot portion 186 can be synonymously referred to as a "dog ear portion" or a "dog ear hot spot" for receiving a dog ear event.

A sixth portion 188 of the touchscreen 130 is designated to provide a depth indication representative of how much of the book is left to be read. In the embodiment illustrated in FIG. 4, the sixth portion 188 is located above the display portion 168. The second hot spot portion 178 can be utilized in conjunction with the sixth portion 188 to provide the depth indication.

In the embodiment of FIG. 4, the display portion 168, the first hot spot portion 170, the second hot spot portion 178, the third hot spot portion 180, the fourth hot spot portion 184, and the fifth hot spot portion 186 are mutually exclusive (i.e. non–overlapping) portions of the touchscreen 130. However, in alternative embodiments of the present invention, these portions may not be mutually exclusive, and hence may overlap. Further, some embodiments of the present invention may utilize different sizes and positions for the above-described hot spot portions.

Preferably, the hot spot portions are motion sensitive so that a touch event, a touch-and-hold event, and a drag event can be sensed

to initiate differing responses. For example, a page back event can be received in the form of a flipping motion (i.e. a short stroke) across the second hot spot portion 178.

FIG. 5 is an illustration of a library screen displayed using an embodiment of the electronic book. In a preferred embodiment, the library screen is displayed upon opening the electronic book or activating the electronic book. The library screen includes a rearward graphical book representation 200 having a graphical spine portion 202. A forward graphical book representation 204 is displayed in front of the rearward graphical book representation 200. The forward graphical book representation 204 has a graphical spine portion 206 and a graphical front cover portion 208. A title 210 of a book currently being read is displayed on the forward graphical book representation 204. In the embodiment illustrated in FIG. 5, the title 210 is displayed on the graphical spine portion 206 of the forward graphical book representation 204.

Upon receiving a user–initiated event in which a portion of the rearward graphical book representation 200 is selected, a title of another book or books of a plurality of books in a library is displayed in place of the title 210 on the forward graphical book representation 204. In a preferred embodiment, the portion of the rearward graphical book representation 200 selected in this user–initiated event is within the graphical spine portion 202.

The titles of the books in the library can be obtained from a storage medium (which contains the books) installed in the electronic book. Alternatively, the titles of the books can be obtained by a connection to an information service providing books or other information in real time. As another alternative, the titles and the books can be accessed on demand from a world-wide web page.

A user can scroll through the library of books by repeatedly touching the spine portion 202 with his or her finger 212 until a desired book title is pulled into view. When the spine portion 202 is selected for a last of the plurality of books, the title of the first book is displayed. In this manner, the user can rotate through the library of books until a desired book is in front.

FIG. 6 is an illustration of a user–initiated event to open the desired book from the library screen. The forward book is opened

upon receiving a user–initiated event in which a portion of the forward graphical book representation 204 is selected. This user–initiated event can include, for example, the user touching the front cover portion 208 of the forward graphical book representation 204 using his or her finger 212. In response to this user–initiated event, the book indicated by a title 214 is opened. If the book is previously unread, the book is opened to page one. If the book has been read before, the book opens to a page which was last read.

FIG. 7 is an illustration of a first page of a book displayed on the touchscreen 130 upon exiting the library screen. To display the first page of the book, the machine–readable data representative of text and graphics from the book is read from either the removable machine–readable storage medium 136 installed in the electronic book, or from the internal machine–readable storage medium 154. Upon reading the machine–readable data, a page of the text and/or the graphics is then displayed on the touchscreen 130. As shown, the text is displayed to appear as a standard page in a real book.

If a user–initiated event is received in which a user selects the second hot spot portion 178, i.e. the page back portion, of the touchscreen 130 when the book is on the first page, then a title page containing system controls is displayed.

FIG. 8 is an illustration of a title page of a book displayed on an embodiment of the electronic book. Information which is displayed on the title page includes a book title 220, author information 222, copyright information 224, a Library of Congress number 226, and publisher information 228. Also displayed are statistics such as a total number of pages 230 in the book, a number of pages left to be read 232, and an elapsed reading time 234.

A number of control options are also displayed. These control options include, but are not limited to, a pacing control option 236, a font selection option 238, a system control option 240, a read–to–me option 242, and a radio frequency (RF) link option 244. Any of these control options can be initiated by a respective user–initiated event indicative of a user selecting the option. As illustrated in FIG. 8, a user is initiating a font selection routine by touching the font selection option 238 using his or her finger 212.

FIG. 9 is an illustration of a font selection page displayed on an embodiment of the electronic book. The font selection page is displayed upon an initiation of the font selection routine.

Displayed on the font selection page are a number of font/size combination options. Each option is in the form of a word displayed using a specific font and a specific size in accordance with the font/size combination. A user selects a desired font/size combination by viewing how words appear in the various combinations, and selecting the combination which is desired. For example, in FIG. 9, the user is selecting a desired font/size combination by selecting a word 250 displayed in the desired font/size combination using his or her finger 212.

The fonts can be selected from internal fonts and custom fonts provided on the medium provided by a publisher. For example, a user may select a Gothic font provided on a medium containing a Shakespeare work instead of default fonts (e.g. Courier, Helvetica, Avant Garde) within the electronic book.

Upon selecting the desired font/size combination, the electronic book automatically flips back to the title page containing the system controls. Thereafter, the electronic book uses the desired font/size combination as a primary font/size combination to display the text of the book. Titles and headings in the book are enlarged and bolded based upon the primary font/size combination. Other portions of text can be italicized based on the primary font. However, it is preferred that the body of the text never be displayed smaller than the size selected in the primary font/size combination. In some embodiments, it may be preferred to display footnotes in a size smaller than the size selected.

FIG. 10 is an illustration of the title page of the book which is displayed upon exiting the font selection page. Here, a user is shown to initiate a system control routine by selecting the system controls option 240 using his or her finger 212.

FIG. 11 is an illustration of a system control page displayed in an embodiment of the electronic book. The system control page is displayed upon executing the system control routine.

The system control page provides a number of display controls including a contrast control 254, a tint control 256, and a color control

258. Each of these controls provides a discrete number of control values which can be directly selected by a user. Further, each control value is displayed in a graphical manner consistent with the result of its selection. For example, the contrast control 254 includes a high contrast graphical representation 262, an intermediate contrast graphical representation 264, and a low contrast graphical representation 266. The graphical representations 262, 264, and 266 are of the same graphical image, but are displayed using different contrast control values. Hence, a user can visually determine a desired contrast by viewing the graphical representations 262, 264 and 266. In a similar manner, the tint control 256 and the color control 258 each display a predetermined graphical image using a discrete number of tint control values and color control values, respectively.

Preferably, the display of the graphical representations within the display controls are unaffected by current values of selected ones of the controls. In one preferred embodiment, the display of the graphical representations is independent of all of the current values. For example, the display of the low contrast representation 266 can be independent of the current contrast control value, the current tint control value, and the current color control value. In another preferred embodiment, the display of the graphical representations in each control is independent of the current value of that control, but depend on the current value of the other controls. Here, for example, the display of the low contrast representation 266 is independent of the current contrast control value, but dependent upon the current tint control value and the current color control value. Using either of these two embodiments, a user can immediately determine a result of each control value selection before actually performing the selection.

The system control page also includes a sound control 267. The sound control 267 is illustrated to have a discrete number of sound intensity values which can be selected by a user. In the embodiment of FIG. 11, the sound intensity values are monotonically related to the size of an ear displayed on the sound control 267. An ear 268 having a slash therethrough is indicative of an option to turn off the sound. For the purpose of illustration, FIG. 11 shows a user selecting an intermediate sound intensity by touching an ear graphic 269. The

user then returns to the system control page by touching the second hot spot portion 178, i.e. the page back hot spot, of the touchscreen 130.

It is noted that the controls on the system control page can provide continuous, rather than discrete, control of the control values in alternative embodiments of the electronic book. Here, for example, the ear size and the volume can increase or decrease based on finger selection movement.

A pad area 270 of the system control page is utilized for testing motions such as a hold event, a turn event, and a mark event. In particular, a user can point to any of a hold selection 271, a turn selection 272, and a mark selection 273, and then perform the selected motion in the pad area 270. Here, a length of hold time or style of dragging a finger for a flip command can be gauged for each user, for example, using the pad area 270.

FIG. 12 is an illustration of the title page of the book which is displayed upon exiting the system control page. Here, the user is illustrated to select the read–to–me option 244 which initiates the voice synthesizer 162 to audibly read the text being visually displayed on the touchscreen 130. The audible reading of the text begins at the last page which was displayed on the touchscreen 130. The reading rate and other controls for the read–to–me routine is provided on a pacing control page described hereinafter.

FIG. 13 is an illustration of the title page of the book wherein a radio frequency link option is selected. This option is selected by the user by touching the RF link option 244 using his or her finger 212. Upon selecting the RF link option 244, an RF link routine is executed. The RF link routine allows the user to download updates of the text to the electronic book, and/or to interface the electronic book to a personal computer or communication unit. The RF link routine utilizes the antenna 158 and the RF modem 160 illustrated in FIG. 3 to communicate with the personal computer using a local wireless link, or more generally to communicate with a wireless data communication network. Utilizing a nationwide wireless data communication network, such as the Ardis network, allows individuals to receive book updates via radio frequency links in major cities.

FIG. 14 is an illustration of the title page of the book wherein a pacing control option is selected by a user. Specifically, the user is shown to initiate a pacing control routine by selecting the pacing control option 236 displayed on the title page using his or her finger 212.

FIG. 15 is an illustration of a pacing control page displayed in an embodiment of the electronic book. The pacing control page is displayed once the user selects the pacing control option 236 from the title page. The pacing control page includes a display 280 of a current reading pace of the user. Based upon the number of pages left in the book, which is given in a display 282, a display 284 of an estimated completion time for the book is also given. In the embodiment of FIG. 15, the current reading pace, the number of pages left, and the estimated completion time are displayed in the form of one or more sentences.

Also displayed on the pacing control page is a display 290 of a desired reading pace. A display 292 of an estimated completion time in accordance with the desired reading pace is also given. The desired reading pace is controlled by the user using a graphical slider bar 294. The pages of the text in the book are automatically paced by a pacing routine which is enabled and disabled by a graphical switch 296. In one embodiment, each page of text is displayed for a duration commensurate with the desired reading rate controlled by the graphical slider bar 294. The user returns to the title page from the pacing control page by selecting the second hot spot portion 178, i.e. the page back portion, of the touchscreen 130.

FIG. 16 is an illustration of the title page of the book which depicts other user-initiated options. The user can return to a book-marked page by selecting the bookmark graphic 182. The user can return to the library screen by selecting the fourth hot spot portion 184, i.e. the close book portion, of the touchscreen 130. The user can go to the first page of the book by selecting the first hot spot portion 170, i.e. the advance page portion, of the touchscreen 130.

FIG. 17 is an illustration of a page marked by a dog ear in an embodiment of the electronic book. The user initiates a dog ear command by performing a predetermined user-initiated event. An example of such an event includes a user touching an upper corner

portion of the touchscreen 130, such as the fifth hot spot portion 186 defined earlier.

If the page is not dog–eared, then a brief touching of the upper corner portion 186 causes a dog ear graphic 300 to be displayed in the upper corner portion. In addition, an indication that this page has been dog–eared is stored either in the removable machine–readable storage medium 136 or the internal machine–readable storage medium 154.

If the user touches the upper corner portion 186 of a page already marked with a dog ear, or if the upper corner portion 186 is held for a duration greater than a predetermined threshold, then a dog ear dialog box is opened.

FIG. 18 is an illustration of a dog ear dialog box used in embodiments of the electronic book. A dog ear dialog box 302 is displayed on touchscreen 130. The dog ear dialog box 302 displays a list 304 of all dog–eared pages. A user can immediately go to one of the dog–eared pages on the list 304 by touching a display of a selected page number.

The dog ear dialog box 302 also displays an option 306 to display marks 308 along an edge 310 of the page. Thereafter, a user can touch any of the marks 308 to move quickly to a corresponding one of the dog–eared pages. In the example illustrated in FIG. 18, a mark 312 corresponds to marked page 1, a dog ear 314 corresponds to marked page 35, a mark 316 corresponds to marked page 94, a mark 318 corresponds to marked page 111, and a mark 320 corresponds to marked page 120. In a preferred embodiment, page one is always marked with a dog ear so that a user can quickly return thereto using either the marks 308 or the dog ear dialog box 302.

Upon receiving a user–initiated event while the dog ear dialog box 302 is displayed, the dog ear dialog box 302 is removed to show the selected page of the book.

FIG. 19 is an illustration of a user selecting a portion of a page of text. A portion 330 is selected by a user–initiated event of sliding his finger 212 (or other pointing member such as a stylus) from a first position 332 to a second position 334. Upon its selection, the portion 330 of the text is highlighted in a predetermined manner. The portion 330 of the text can be highlighted in color if the touchscreen

130 is capable of a color display. Alternatively, the portion 330 of the text can be highlighted using grey scale shading, reverse video, or underlining. An option selection dialog box is then displayed on the touchscreen 130 to provide the user a number of text marking options.

FIG. 20 is an illustration of an option selection dialog box used in embodiments of the electronic book. An option selection dialog box 340 is displayed on the touchscreen 130 in a location out of the way of the portion 330 of the text that is marked when possible. The option selection dialog box 340 includes a plurality of text marking options including a note capture option 342, a highlighting option 344, a quote capture option 346, and a set bookmark option 348.

Briefly, the note capture option 342 allows a user to type in notes associated with the portion 330 of the text. The highlighting option 344 leaves the portion 330 of the text highlighted, and stores an indication of this highlighting so that any subsequent return to this page displays the portion 330 as being highlighted. The quote capture option 346 allows a user to store the portion 330 of the text along with source data, such as the name of the author of the book or the title of the book, in the internal machine-readable storage medium 154. The set bookmark option 348 can be selected to add a bookmark to the current page. If the page already has a bookmark, then a number of bookmark management options similar to options used for the dog ear command are provided to the user.

FIG. 21 is an illustration of an annotation display used in embodiments of the electronic book. The annotation display is provided in response to a user selecting the note capture option 342 illustrated in FIG. 20. After receiving a user-initiated event indicative of selecting the note capture option 342, a soft keyboard 360 is displayed on the touchscreen 130. The soft keyboard 360 includes alphanumeric keys and symbolic keys along with a close key and a notes collection key.

A plurality of keystroke events are received by the soft keyboard 360 to form an annotation. As the keystroke events are received, a plurality of characters corresponding thereto are displayed in a window 362 on the touchscreen 130.

The user selects the close key on the soft keyboard 360 upon completing the annotation. In response to selecting the close key, the electronic book removes the soft keyboard 360 and the window 362 from the touchscreen 130 and displays a note marker icon to indicate that the page has an annotation associated therewith.

The notes collection key on the soft keyboard 360 commands the electronic book to communicate the annotation to an external device such as a personal computer. The personal computer can be interfaced to the electronic book either wirelessly via the antenna 158 and the radio frequency modem 160 shown in FIG. 3, using a wire-based connection via the data interface 156, or using an infrared link.

An annotation can also be in the form of an image of pixels which overlays the page of the text. The pixels can be drawn on the touchscreen 130 using a pointing device. The pixels can be stored in a pixel-map form for subsequent viewing or for subsequent conversion to text using a handwriting recognition method.

As another option, an accessory keyboard can be added to the electronic book to enter the annotation as well as other information.

FIG. 22 is an illustration of a marker used to indicate that a page has an annotation associated therewith. The page illustrated in FIG. 22 results after the user enters the annotation and selects the close key from the soft keyboard 360 as illustrated in FIG. 21. As shown, the page in FIG. 22 no longer has the soft keyboard 360 and the window 362 displayed thereon. However, a note marker icon 370 is displayed in a lower corner of the page. The user can view the annotation associated with this page by selecting the note marker icon 370. Selecting the note marker icon 370 has the same effect as selecting the note capture option 342 as shown in FIG. 20.

Further, an annotation can be indicated by underlining or highlighting the portion of the text associated with the annotation. The annotation can be viewed in a hypertext-type manner by selecting the portion of text.

FIG. 23 is an illustration of a user selecting a set bookmark option in the option selection dialog box. The user selects the set bookmark option 348 by touching the displayed text associated therewith using his or her finger 212 or other pointing member. If

this page had already included a bookmark, then a bookmark management dialog box is displayed similar to the one used for the dog ear command. Since the page illustrated in FIG. 23 does not have a bookmark associated therewith, the selection of the set bookmark option 348 causes a bookmark to be added to the page. In a preferred embodiment, only one page is bookmarked within each book.

FIG. 24 is an illustration of the page of FIG. 23 having a bookmark displayed thereon. A bookmark icon 380 is displayed in an upper portion of the page to indicate that the page has been bookmarked.

It is noted that pointing devices other than an individual's finger may be utilized to generate user-initiated events indicative of desired selections using the touchscreen 130. For example, a stylus or the like can be utilized to select desired portions of the touchscreen 130.

It is also noted that various types of graphical controls can be utilized to control settings and parameters of the electronic book. These graphical controls include, but are not limited to, graphical buttons, checkboxes, radio buttons, scroll bars, slider bars, pop-up menus, and dialog boxes.

Next, a description of steps which are performed by the various components of the electronic book to provide its features and functionality is presented. These operational steps are performed on or with the aid of the processor 152 illustrated in FIG. 3. The processor 152 is directed to function in a manner in accordance with these operational steps based upon a computer program or other form of software or firmware stored in a computer readable memory. The computer readable memory can be contained with the processor 152, within the internal machine-readable memory 154, or within a separate machine-readable storage medium in communication with the processor 152.

It is noted that the order in which the steps are described are indicative of one embodiment of the present invention, and that alternative embodiments of the present invention may perform the steps in a different order to achieve the same functionality.

FIG. 25 is a flow diagram of an event loop performed in an embodiment of the electronic book. As indicated by block 400, a step of executing a library graphical user interface routine is performed. The library graphical user interface routine provides a virtual library to allow a user to select a book to read from a plurality of books within a library, and/or access an information service or world-wide web page as previously described. The plurality of books can be contained in one or more removable machine-readable storage media and/or the internal machine-readable storage medium.

Upon selecting a desired book, a step of executing a routine to display one or more pages of text and graphics from the desired book is performed as indicated by block 402. The routine to display the pages of text is executed until a predetermined user-initiated event is received to exit the routine. As indicated by block 404, if a close book event is received, then flow of the event loop is directed back to the step of executing the library graphical user interface routine in block 400.

If a page back event is received when the current page of text being read is page one, then a step of displaying a title page of the book is performed as indicated by block 406. The title page provides a number of control options available to a user. The user selects a desired control option based upon a user-initiated event. Block 408 indicates a step of receiving this user-initiated event.

Based upon the user-initiated event which is received, flow of the event loop is directed to one of a number of subroutines in a step indicated by block 410. If the received event is indicative of the user selecting the pacing control option, then a step of executing a pacing control routine is performed as indicated by block 412. If the received event is indicative of the user selecting the font selection option, then a step of executing a font selection routine is performed as indicated by block 414. If the received event is indicative of the user selecting the system control option, then a step of executing a system control subroutine is performed as indicated by block 416. If the received event is indicative of the user selecting the RF link option, then a step of executing an RF link subroutine is performed as indicated by block 420. Upon completing either the pacing control subroutine, the font selection routine, the system control routine, or

the RF link routine, flow of the event loop is directed back up to block 406 wherein the step of displaying the title page is performed.

If the received event from block 408 is indicative of the user selecting the read–to–me option, then a step of executing a read–to–me routine is performed as indicated by block 422. Flow of the event loop is then directed back to block 402 to execute the routine to display pages of text from the book. The execution of the read–to–me routine in block 422 provides a spoken, auditory display of the text in addition to the visual display of the text in block 402.

If the event received in the step of block 408 is an advance page event, then a step of setting the current page to page one is performed as indicated by block 424. If the received event is indicative of the user selecting a bookmark displayed on the title page, then a step of setting the current page to a previously bookmarked page is performed as indicated by block 426. After the current page is set in either of the steps indicated by blocks 424 and 426, then flow of the event loop is directed back to the step of executing the routine to display pages of text indicated by block 402.

Finally, if the event received in block 408 is indicative of a close book event, then flow of the event loop is directed back to block 400 to perform a step of executing the library graphical user interface routine.

FIG. 26 is a flow diagram of steps performed in an embodiment of a library graphical user interface routine for use in the electronic book. These steps can be performed in executing the library graphical user interface routine indicated by block 400 in FIG. 25. The steps provide a method of selecting a book for reading in an electronic book where the book is selected from a plurality of books in a library.

As indicated by block 430, a step of displaying a rearward graphical book representation having a graphical spine portion is performed. A step of displaying a forward graphical book representation in front of the rearward graphical book representation is performed as indicated by block 432. The forward graphical book representation has a graphical spine portion and a graphical front cover portion.

As indicated by block 434, a step of displaying a title of a first book of the plurality of books on the forward graphical book representation is performed. The title of the first book can be displayed anywhere on the forward graphical book representation. However, in a preferred embodiment, the title of the first book is displayed on the graphical spine portion of the forward graphical book representation. FIG. 5 illustrates an example of the rearward graphical book representation 200 having the graphical spine portion 202, the forward graphical book representation 204 having the graphical spine portion 206 and the graphical front cover portion 208, and the title 210 displayed on the forward graphical book representation 204.

With reference again to FIG. 26, a step of receiving a first user-initiated event in which a portion of the rearward graphical book representation is selected is performed as indicated by block 436. In a preferred embodiment, the portion of the rearward graphical book representation selected in this step is within the graphical spine portion of the rearward graphical book representation. Upon receiving the first user-initiated event, a step of displaying a title of a second book of the plurality of books is performed as indicated by block 440. Preferably, the title of the second book is displayed in place of the title of the first book on the graphical spine portion of the forward graphical book representation.

As indicated by block 442, a step is performed of receiving a second user-initiated event in which a portion of the forward graphical book representation is selected. In a preferred embodiment, the portion of the forward graphical book representation selected in this step is within the front cover portion of the forward graphical book representation. The reception of the second user-initiated event ends the execution of the library graphical user interface routine, and flow is directed to the routine to display pages of text from the second book. Here, steps are performed of reading machine-readable data from a machine-readable storage medium installed in the electronic book, the machine-readable data being representative of text from the second book, and displaying the text represented by the machine-readable data.

It is noted that the steps indicated by blocks 436 and 440 can be repeated to allow the user to rotate through the plurality of books. When the first user-initiated event is received while a last of the plurality of books is displayed, the next title displayed is that of the first of the plurality of books.

It is preferred that steps of displaying and receiving user-initiated events all be performed using the touchscreen 130 integrated in the electronic book. However, in alternative embodiments of the electronic book which include a series of buttons external to the touchscreen 130, any of the above-described user-initiated events may be received using these buttons.

FIGs. 27 and 28 show flow diagrams of an embodiment of the routine to display pages of text in the electronic book. The steps indicated in these flow diagrams are performed in one embodiment of the step indicated by block 402 in FIG. 25.

Upon entering the routine, a step of displaying a current page of the book is performed as indicated by block 450. The current page includes text from the current page of the book, a graphical display of a number of pages remaining in the book, a display of a bookmark graphic if there is a bookmark associated with the current page, a dog ear graphic if the current page is dog-eared, and a note marker icon if there is an annotation associated with the current page. Optionally, the current page includes graphics from the current page of the book.

After displaying the current page, a branching step is performed, as indicated by block 452, based upon any user-initiated events which are received. If a user-initiated event is received which selects a portion of the text, a step of marking the portion of the text is performed as indicated by block 454. The portion of the text can be marked either by color or grey scale highlighting the portion of the text, underlining the portion of the text, or displaying the portion of the text in a reverse video form. The portion of the text can be selected directly by a user sliding a finger or a stylus over the portion of the text. Alternatively, the portion of the text can be selected indirectly by a menu selection technique.

After the portion of the text has been marked, a step of displaying an option selection dialog box is performed as indicated by block 456. The option selection dialog box provides a plurality of

options to the user, including a note capture option, a highlighting option, a quote capture option, and a set bookmark option.

As indicated by block 460, a step of receiving a user-initiated event indicative of a selection of one of the options is performed. Based upon the selection, a branching step is performed as indicated by block 462. If the note capture option is selected, then a step of executing an annotation subroutine is performed as indicated by block 464. If the quote capture option is selected, then a step of executing a quote capture subroutine is performed as indicated by block 466. If the highlighting option is selected, then a step of executing a highlighting subroutine is performed as indicated by block 470. If the set bookmark option is selected, then a step of executing a bookmark subroutine is performed as indicated by block 472.

Upon completing the execution of either the annotation subroutine, the quote capture subroutine, the highlighting subroutine, or the bookmark subroutine, a step of determining whether a pacing mode is active is performed as indicated by block 474. If the pacing mode is inactive, then flow of the routine is directed back to block 452 which performs a branching step based upon a received user-initiated event. If the pacing mode is active, then a step of determining whether a highlighting mode is active is performed as indicated by block 476. If the highlighting mode is active then a step of scrolling a highlight across the current page is performed as indicated by block 480. Scrolling the highlight across the current page allows pacing of a user's scanning across the current page. A user can activate the highlighting mode to help enhance his or her reading speed.

The highlight which is scrolled across the page can be in the form of either a color or grey scale highlight, an underlining of text, or a reverse video form of text. If the touchscreen 130 is capable of selective backlighting, then the highlight can be in the form of a selective backlighting of a reduced portion of the touchscreen 130.

After scrolling the highlight across the current page in block 480 or if the highlighting mode is inactive, then a step of determining whether it is time for displaying a subsequent page is performed as indicated by block 482. If the time has not yet come for displaying a

subsequent page, then flow is directed back to block 452. If the time has arrived for displaying a subsequent page, then a step of updating the current page is performed as indicated by block 484. Next, a step of displaying a forward page turn in an animated matter is performed as indicated by block 486. This step includes displaying an animated sequence of images which simulates a forward flipping of a page. Flow of the routine is then directed back to block 450 to display the new current page.

With reference to block 452, if a user–initiated event is received indicative of the user selecting the note marker icon, then the step of executing the annotation routine indicated by block 464 is performed. Thereafter, subsequent steps are performed beginning with the step indicated by block 474.

With reference to the branching step performed in block 452, if a dog ear user–initiated event is received, then a step of executing a dog ear routine is performed as indicated by block 490. If the user–initiated event is indicative of the user selecting the bookmark portion of the page, then a step of executing a bookmark management routine is performed as indicated by block 491. Thereafter, subsequent steps are performed beginning with the step indicated by block 474. Similarly, if no user–initiated events are received in block 452, then flow of the routine is directed to the step indicated by block 474.

If the user–initiated event is indicative of the user selecting the page back portion of the page, then flow from block 452 branches to a step of decrementing the current page as indicated by block 492. Further, a step of displaying a backward page turn in an animated matter is performed as indicated by block 494. This step includes displaying an animated sequence of images which simulates a backward flipping of a page. The steps indicated by blocks 486 and 494 give the user the sense or feel that a page of information is being turned in place, carrying forward the familiar paradigm of turning the page on a standard paper book.

As indicated by block 496, a step of determining whether the new current page is the title page is performed after the step of block 494. If the new current page is the title page, then execution of the routine to display pages of text in the electronic book is completed as

indicated by block 500. If the new current page is any page but the title page, then flow of the routine is directed back to block 450 wherein a step of displaying the new current page is performed.

If the user–initiated event is indicative of the user selecting the advance page portion of the page, then flow is directed from the step indicated by block 452 to a step of incrementing the current page as indicated by block 502. Further, a step of displaying a forward page turn in an animated matter is performed is indicated by block 504. Flow of the routine is then directed back to block 450 wherein the new, incremented current page is displayed.

FIG. 29 is a flow diagram of steps performed to display a current page in the electronic book. These steps constitute one embodiment of a method of performing the step indicated by block 450 in FIG. 27.

As indicated by block 510, a step of displaying text from the current page of the book is performed. The text is displayed in accordance with a primary font parameter and a primary size parameter. If there is any highlighting associated with a portion of the text on the current page, then a step of displaying the portion of the text in a highlighted manner is performed as indicated by block 512. If any graphical information is included in the current page, then a step of displaying the graphical information is performed as indicated by block 513.

As indicated by block 514, a step of graphically displaying a number of pages remaining in the book is performed. The number of pages remaining in the book can be displayed in the sixth portion 188 of the touchscreen 130 as illustrated in FIG. 4. The number of pages remaining in the book can be graphically displayed using either an image of a number of pages, a dark line as a drop shadow, or a group of parallel lines to indicate relative depth by page number in a given document. When the current page is one of the early pages in the book, the drop shadow or graphical image depth is relatively deep, indicating that there is a significant portion of the book remaining to be read. When the current page is near the middle of the book, the drop shadow or graphical image depth is half as deep. When nearing the end of the book, the drop shadow or graphical image depth becomes very thin indicating that the reader is almost at the end of

the book. As a result, the user can determine at a glance how much of the book has been read, and their relative position within the book just as a standard paper book. As an alternative to using a top portion of the touchscreen for graphically displaying the number of pages remaining in the book, a side edge and/or a bottom edge of the touchscreen 130 can be utilized to provide this graphical display.

As indicated by block 516, a step of determining if a bookmark is associated with the current page is performed. If a bookmark is associated with the current page, then a step of displaying a bookmark graphic is performed as indicated by block 520.

As indicated by block 522, a step of determining if the current page is dog–eared is performed. If the current page is dog–eared, then a step of displaying a dog ear graphic is performed as indicated by block 524.

As indicated by block 526, a step of determining whether an annotation exists for the current page is performed. If there is an annotation associated with the current page, then a step of displaying a note marker icon is performed as indicated by block 530.

FIG. 30 is a flow diagram of steps performed in an embodiment of an annotation routine. Such an annotation routine is executed in the step indicated by block 464 in FIG. 28.

As indicated by block 540, a step of displaying a window for displaying the annotation is performed. As indicated by block 542, a step of displaying a soft keyboard on the touchscreen 130 is performed. The soft keyboard is provided to receive a plurality of keystroke events to form the annotation.

After displaying the soft keyboard and the annotation window, a step of receiving a keystroke event is performed as indicated by block 544. As indicated by block 546, a branching operation is performed based upon the keystroke event received in block 544. If the keystroke event is indicative of the user selecting either an alphanumeric key or a symbolic key on the soft keyboard, then a step of displaying a character associated with the key is performed as indicated by block 560. The character associated with the key is displayed within the annotation window. After displaying the character, flow of the routine is directed back to block 544 wherein a subsequent keystroke event is received.

Referring back to the branching step indicated by block 546, if the keystroke event is indicative of a user selecting the close key from the soft keyboard, then a step of closing the soft keyboard is performed as indicated by block 562. A step of closing the annotation window is also performed, as indicated by block 564. As indicated by block 566, a step of displaying a note marker icon on the page is performed. Thereafter, execution of the annotation subroutine is completed.

With reference again to the branching step performed in block 546, if the keystroke event is indicative of the user selecting the notes collection key, then a step of communicating the annotation to an external personal computer is performed as indicated by block 570. After communicating the annotation to the personal computer, flow of the routine is directed back to block 544 wherein a subsequent keystroke event is received.

FIG. 31 is a flow diagram of steps performed in an embodiment of a quote capture subroutine. Such a quote capture subroutine can be performed to provide the step indicated by block 466 in FIG. 28.

Prior to entering the quote capture subroutine, a user-initiated event was received in the electronic book which selects a portion of the text displayed on the touchscreen. After receiving the user-initiated event, a plurality of text marking options, including a quote capture option, is displayed, and a user-initiated event indicative of a user selecting the quote capture option is received.

As indicated by block 580, a step of storing quote data representative of the portion of the text is performed. The quote data is stored in the internal machine-readable storage medium 154 illustrated in FIG. 3.

As indicated by block 582, a step of storing source data which identifies the source of the quote data is performed. The source data can be representative of the author of the book, the title of the book, a copyright date of the book, and/or a publisher of the book. The source data is stored in the internal machine-readable storage medium 154 from FIG. 3.

As indicated by block 584, a step is performed of maintaining the quote data and the source data in the internal machine-readable storage medium when the removable machine-readable storage

medium is removed from the electronic book. As a result of this step, subsequent steps can be performed based upon the quote data and the source data when the removable machine–readable storage medium is removed. Specifically, a step of retrieving the quote data and the source data from the internal machine–readable storage medium can be performed when the removable machine–readable storage medium is removed from the electronic book. Thereafter, a step of displaying the portion of the text represented by the quote data and source information represented by the source data can be performed.

FIG. 32 is a flow diagram of steps performed in an embodiment of a dog ear subroutine. Such a dog ear subroutine is executed in the step indicated by block 490 in FIG. 27.

As indicated by block 590, a step is performed of determining a duration in which a dog ear portion of the touchscreen is held. A step of comparing the duration to a predetermined threshold is performed as indicated by block 592. The predetermined threshold can be about a second. If the duration is less than the predetermined threshold, then a step of determining whether the current page has a dog ear is performed as indicated by block 594. If the current page does not have a dog ear, then a step of storing an indication that the current page be dog–eared is performed as indicated by block 596. Further, a step of displaying a dog ear graphic in an upper corner portion of the touchscreen 130 is performed as indicated by block 600. Thereafter, execution of the dog ear subroutine is completed.

With reference to blocks 592 and 594, if the duration is greater than or equal to the predetermined threshold or if the current page is already dog–eared, then a step of displaying a dog–eared dialog box is performed as indicated by block 602. Within the dog–eared dialog box, a list of all marked pages is displayed. Further, an option to show marks corresponding to all of the marked pages along an edge of each page is displayed.

As indicated by block 604, a user–initiated event is received. As indicated by block 606, a branching step is performed based upon the user–initiated event received. If the user–initiated event is indicative of a user selecting a page number from the list of marked pages, then a step of setting the current page to the selected page number is

performed as indicated by block 610. If the user–initiated event is indicative of the user selecting the marking option, then a step of displaying marks corresponding to the dog–eared pages along an edge of the page is performed as indicated by block 612.

FIG. 33 is a flow diagram of steps performed in an embodiment of a pacing control subroutine. The pacing control subroutine is executed in the step indicated by block 472 in FIG. 25.

As indicated by block 620, a step of determining a number of pages remaining in the book is performed. As indicated by block 622, a step of determining a current reading pace of the user is performed.

Based upon the number of pages remaining in the book, a step of calculating one or more estimated completion times is performed as indicated by block 624. A first estimated completion time can be calculated by dividing the number of words or pages remaining in the book by the current reading pace of the user. As a result, the first estimated completion time estimates how long it would take the user to complete the book at his or her current reading pace. A second estimated completion time is calculated by dividing the number of words or pages remaining in the book by a desired reading pace. The second estimated completion time estimates how long it would take the user to complete the book at the desired reading pace.

As indicated by block 626, a step of displaying each estimated completion time is performed. Each estimated completion time can be displayed within a corresponding sentence as illustrated in FIG. 15.

As indicated by block 630, a step of calculating a necessary reading pace to satisfy a predetermined reading goal is performed. The predetermined reading goal can be in the form of a time duration within which a user wishes to complete the pages remaining in the book. Here, the necessary reading pace is calculated by dividing the number of pages remaining in the book by the time duration. A step of displaying the necessary reading pace to satisfy the reading goal is then performed as indicated by block 632.

As indicated by block 634, a step of displaying one or more graphical pacing controls is performed. As illustrated in FIG. 15, the one or more graphical pacing controls can include a graphical slider bar such as the graphical slider bar 294 used for modifying the desired reading pace, and a graphical switch such as the graphical

switch 296 which is used for enabling and disabling an automatic pacing of the text using a pacing routine.

As indicated by block 636, a user-initiated event is received. As indicated by block 640, if the user-initiated event is indicative of the user selecting the page back portion of the touchscreen 130, then execution of the pacing control subroutine is terminated. Upon terminating the pacing control subroutine, the system control page is displayed on the touchscreen 130.

If the user-initiated event is not indicative of the user selecting the page back portion, then a step of updating a pacing parameter based on the user-initiated event is performed as indicated by block 642. Examples of the pacing parameter include the desired reading pace and the reading goal. After updating the pacing parameter, flow of the subroutine is directed back to block 624 to recalculate an estimated completion time and the necessary reading pace.

FIG. 34 is a flow diagram of steps performed in an embodiment of the font selection subroutine. The font selection subroutine is executed in block 414 in the event loop of FIG. 25.

As indicated by block 650, a step of displaying a plurality of words using a corresponding plurality of combinations of different fonts and different sizes is performed. More specifically, each word is displayed using a specific font and a specific size in accordance with the combination corresponding thereto. Optionally, the step of displaying the plurality of words can include displaying a respective font name for each of the combinations. As another option, the step of displaying the plurality of words can include displaying a single textual expression using the corresponding plurality of combinations.

As indicated by block 652, a step of receiving a user-initiated event indicative of the user selecting one word of the plurality of words is performed. This selection indicates which font/size combination is desired by the user.

As indicated by block 654, a step of updating a primary font parameter and a primary size parameter is performed. The primary font parameter and the primary size parameter are updated in accordance with the font/size combination selected by the user. As indicated by block 656, a step of automatically returning to displaying the title page is performed after receiving the user-initiated event

selecting the one word. Thereafter, a subsequent step of displaying text of a book includes displaying the text using the primary font in a size at least the primary size.

FIG. 35 is a flow diagram of steps performed in an embodiment of the system control subroutine. The system control subroutine is executed in the step indicated by block 416 in the event loop of FIG. 25.

As indicated by block 660, a step of displaying a plurality of graphical controls for setting system parameters is performed. The system parameters can include display parameters such as a contrast parameter, a tint parameter, and a color parameter. The system parameters can also include a sound parameter.

As indicated by block 662, a step of receiving a user–initiated event is performed. If the user–initiated event is indicative of the user selecting the page back portion of the touchscreen, as indicated by block 664, then execution of the system control subroutine is completed. For other user–initiated events, a step of updating a system parameter is performed as indicated by block 668.

As described earlier, the electronic book uses a unique method of encoding words on the book card or removable machine-readable storage medium 136. An embodiment of the method of storing (encoding) text is shown in FIG. 36. The process starts, step 702, by converting a plurality of text strings to a plurality of pointers at step 704. The plurality of pointers consist of a plurality of data bits. The plurality of data bits used to form the plurality of pointers are compressed, step 706, and the process ends at step 708. In the preferred embodiment the compression is performed using a Huffman compression technique. In another embodiment, the bits used to compress the pointers at 706 are metered. In this way the publisher knows the total number of bits used to store the text of the book. The publisher uses this information in determining the total storage requirements for the book card, which in turn is a factor in pricing the book card. In addition, the publisher uses this information for determining licensing fees for use of less than the whole book. For instance, if another publisher wishes to use only the first chapter of the book in one their books, the publisher charges a licensing fee based on the number of bits in the first chapter.

FIG. 37 is an embodiment of the steps used to store text. The process starts, step 710, by determining if the first string is contained in a permanent dictionary (the permanent dictionary is described in more detail with respect to FIG. 40) at step 712. When the string is contained in the permanent dictionary the string is converted to a pointer at step 714. When the string is not contained in the permanent dictionary, it is determined if the string is contained in a special dictionary at step 716. When the string is contained in the special dictionary, it is converted to a pointer at step 714. When the string is not contained in the special dictionary, it is determined if the string should be added to the special dictionary at step 718. When the string is added to the special dictionary it is converted to a pointer at step 714. When the string is not added to the special dictionary, it is left as a string at step 720. After the string is either converted to a pointer at step 714 or left as a string at step 720, it is determined if the process has reached the end of the file at step 722. When the process has not reached the end of the file, the process returns to step 712. When the process has reached the end of the file, a statistical analysis of the underlying data bits is performed at step 724. This statistical analysis is used to form a code table at step 726. The underlying data bits are then compressed at step 728, and the process ends, step 730.

An embodiment of a method for storing clear text ASCII to a compressed file (pointers) is a C program fun on a general purpose computer. The program has to distinct phases: a word-to-pointer lexicographic encoding phase and a character-to-bit-string probabilistic compression phase. In the encoding phase, the program interactively builds/expands a standard dictionary and a custom dictionary. For each word in the clear text file the program attempts to find the word in the standard dictionary (SD). If the word is found in the SD the program continues to the next word. If the word is not in the (SD), the program asks if the new word should be added to the SD. If the answer is affirmative, the word is added before proceeding to the next work. If the answer is negative, the program searches the custom dictionary (CD) and, if the word is found, again proceeds to the next word. If the word is not found in the CD, the program asks if the new word should be added to the CD. If the answer is affirmative, the

word is added before proceeding to the next word. If the answer negative, the program simply proceeds to the next word. At the end of the first pass, all normal words in the text file should be in either the SD or the CD; special character sequences (e.g., a deleted #@% expletive) should be expressly excluded and treated simply as embedded ASCII strings (see, below). In one embodiment the program can start with an existing SD and CD. In another embodiment the program can start with an existing SD and build an SD, or vice versa.

In the second or encoding pass, the program utilizes the SD and CD built in the first pass to encode the clear text file into an encoded text file. As in pass one, the program extracts each word in the clear text file and attempts to find the word in the SD file. If the word is found in the SD, the program constructs an SD pointer indicating where the word was found in the SD, and appends the pointer to encoded text file. If the word is not in the SD, the program searches the CD. If the word is found, the program constructs a CD pointer indicating where the word was found in the CD, and appends this pointer to the encoded text file. If the word is not found in either the SD or the CD, the program appends each of the characters of the string into the encoded text file, prefacing each character with an appropriate control code.

In the second phase the program performs the probabilistic (Huffman coding) compression, making two passes through the encoded text file. In the first or construction phase the program reads the encoded text file, counting the number of occurrences of each of the 256 possible 8-bit ASCII characters. Using this statistical information, the program constructs a Huffman table wherein the most frequently occurring character is assigned a very short replacement bit string and the least most frequently occurring character is assigned a much longer replacement bit string, all other intervening characters being assigned respective bit strings indicative of their frequency.

In the second pass, the program utilizes the Huffman table built in the first pass to compress the encoded text file into a compressed, encoded text file. In this pass, the program extracts each 8-bit character in the encoded text file, finds the corresponding

replacement bit string in the Huffman table, and writes these bit strings to the compressed text file. Note that the encoded text file contains several working table preceding the actual object bit stream. These tables are preserved during the compression phase. In addition, the program prepends the Huffman table to the compressed, encoded text file. This aspect is very important for security reasons. If this table is maintained in the protected memory within the book card's MCU then the remainder of the file can be in off-chip (but on-card) memory. This is because without this table, the rest of the stuff is pure gibberish, even if the encoding formats given below are made public. In another embodiment, the program during the second pass of the second phase has the ability to accept chapter boundary markers embedded in the encoded text file, and to build a chapter displacement table which indicates each chapter's starting location in the compressed, encoded text file. This chapter table would then be included on the data card to facilitate the back-up and resume functions.

Below are tables showing the encoding formats used by the program.

CODE	PAD	FILE

Code Field:

ASCII clear text (including Control Functions)	0
Standard Dictionary (1st letter non-capitalized)	10
Custom Dictionary (1st letter non-capitalized)	110
Standard Dictionary (1st letter capitalized)	1110
Custom Dictionary (1st letter capitalized)	11110

Pad Filed:

No leading space preceding this word	0
Leading space preceding this word	1

Data Field:

ASCII - [7:0] standard 8-bit code

Standard Dictionary Pointer - [15-0] index into SD file

Custom Dictionary Pointer - [11-0] index into CD file

Control Functions:

Function	Def	Code
Horizontal Tab	HT	009
New Paragraph	NP	010
Clear Screen/New Page	PG	012
Center Text	CT	001
Tab to Center	TC	011
CAPITALIZE all preceding word	CW	003
Ellipsis (. . .)	EL	201
Umlaut (e.g., ü)	UM	005
Start repeat of control function, e.g. italicize	CO	006
Stop repeat of control function	ST	007
Backspace (i.e., overstrike)	BS	008
Italicize next word (repeatable)	IT	014
Underline next word (repeatable)	UN	095
Bold next word (repeatable)	BO	015
Highlight next word (repeatable)	HL	016
ASCII Text String start/stop delimiter (For long strings, i.e.,>10 characters)	TS	024
Possessive case 1 - s'	P1	017
Possessive case 2 - 's	P2	018
Contraction case 1 - 'll	C1	019
Contraction case 2 - 'd	C2	020
Contraction case 3 - 've	C3	021
Contraction case 4 - 're	C4	022
Contraction case 5 - n't	C5	023
Contraction case 6 - 'm	C6	025
End-of-text	EOT	004

The standard and custom dictionaries have the same basic format. The SD contains all of the most commonly used words, while the CD contains all, or at least most, of the other words in a 'book' not already present in the SD. The current SD contains about 35,000 words. Each dictionary file contains the following structures:

Word Pointer Base Table:

Entry 1 is the total number of words in the Dictionary;

Entries 2 through 27 are (fast binary search pointers into the Dictionary to the corresponding 26 letter of the alphabet, E.g.,Entry 2 points to the letter 'A' while Entry 27 points to the letter 'Z'; and

Entry 28 points to the last word in the Dictionary.

Dictionary:

Lower case ASCII text of each of the words in the Dictionary, arranged in standard alphabetical order, including each of the letters of the alphabet *pre se*.. Words are separated from each other by a space.

In one embodiment the SD would be included in as a permanent part of the electronic book. The SD could be updated by a separate data card 136. The custom dictionary is included in the book card together with the compressed, encoded text and control files.

In one embodiment the electronic book would dynamically construct the CD in its working storage, so that all subsequent references would be by CD pointer alone. In another embodiment, the CD is a separate file on the book card, but no front-end download is necessary. During the host-to-book card handshake, the book card MCU can advise the host MPU of the size of the on-card CD. Having built the necessary (empty) structure to accommodate the CD entries, the host MPU can quite easily detect when the book card MCU subsequently passes it a pointer to an empty CD entry. In response to a suitable request, the book card MCU can rapidly do the on card look-up and pass the corresponding word to the MPU to update its on-book CD structure.

FIG. 38 is a block diagram of an embodiment of the electronic book (apparatus) 740. A card reader (interface) 150 receives the book card 136. The book card 136 (see FIG. 39) contains a special dictionary 742, a plurality of pointers 744 and a compression code 746. In the preferred embodiment the compression code is a Huffman coding table. The processor 152 decompresses the plurality of pointers 744 using the compression code 746. The processor then

reads the plurality of pointers 744 on the book card 136 and associates each the pointers 744 with an ASCII string representing a word in a general dictionary 748. The general dictionary 748 is contained on the memory (internal memory) 154 and contains a plurality of words. The memory 154 also contains a page memory 750. The word is then displayed on a display (touchscreen) 130. A speaker 752 is connected to the processor 152 and is used for "reading" the book out load.

FIG. 40 is a schematic representation of an embodiment of a permanent dictionary 760. The permanent dictionary 760 is made up of a plurality of entries 762. The entries 762 consist of three columns: an index 764 containing a pointer; an ASCII entry 766 representing a word or control character; and a phonetic code (phonetic representation) 768 used for voicing the words (i.e., to read the book). In one embodiment the special dictionary 742 follows the same format as the permanent dictionary 760. When a book card 136 is inserted into the electronic book 740, the processor 153 stores the entries of the special dictionary 742 in the associated index or pointer 764. A certain number of the pointers 764 in the permanent dictionary 760 are empty and reserved for use by the special dictionary 742. The special dictionary 742 contains words that are not in the permanent dictionary 748. For instances, proper names are stored in the special dictionary 742.

In another embodiment each of the pointers on the book card is preceded by a code. The code tells the electronic book 740 whether to look for the pointer in the permanent dictionary 748 or in the special dictionary 742. The code can also be used to determine if the word should be capitalized.

FIG. 41 is a schematic representation of an embodiment of the page memory 750. After the processor 152 associates one of the plurality of pointers 744 with an ASCII word 766, the ASCII word 766 is stored in a page memory 750. When the page memory 750 is full, a page of text is displayed on the display 130.

FIG. 42 is a block diagram of an embodiment of the speech synthesis circuitry for reading the book out load to the user. The processor 152 retrieves the phonetic code 768 from the dictionary. The processor 152 converts the phonetic code 768 into a digital

waveform 770. The digital waveform 770 is converted into an analog waveform 772 by a digital to analog converter 774. The analog waveform 772 is connected to an input 776 of the speaker 752. In this way the phonetic code is converted into sound.

FIG. 43 is a flow chart of an embodiment of the steps used by the electronic book 740 to display text. The process starts, step 780, by the processor decompressing the information on the book card at step 782. Next one of the plurality of pointers is read at step 784. The processor then searches the permanent dictionary for the associated ASCII word at step 786. When the book card is inserted into the electronic book the processor downloads the special dictionary entries into the permanent dictionary. When the book card is removed or the book is closed the contents of the special dictionary are removed from the permanent dictionary. At step 788 the associated ASCII string is stored in the page memory. The processor then determines if the page memory is full at step 790. If the page memory is not full, the process returns to step 782. If the page memory is full, the electronic book displays the characters associated with ASCII strings on the display at step 792. As a result a subset of the plurality of words in the permanent dictionary is displayed in a predetermined sequence. The plurality of pointers are stored in a predetermined sequence. This is what allows the electronic book to display a page of a book, instead of just random characters. This process is repeated for every page of the book.

Thus there has been described a data compression and presentation method and apparatus. The data compression significantly reduces the storage capacity necessary for the book card. In addition, the compression code acts as security code that prevents random copying. The method and apparatus allow the book to be displayed or read out loud. While the invention has been described in conjunction with specific embodiments thereof, it is evident that many alterations, modifications, and alterations will be apparent to those skilled in the art in light of the foregoing description. Accordingly, it is intended to embrace all such alterations, modifications, and variations in the appended claims.

What is claimed is:

Claims

1. A method of presenting text, comprising the steps of:

(a) reading one of a plurality of pointers stored as computer-readable data on a removable machine-readable storage medium installed in a electronic book;

(b) searching for an ASCII string, associated with one of the plurality of pointers, in a permanent dictionary in the electronic book;

(c) storing the ASCII string in a page memory;

(d) repeating steps (a)-(c) until the page memory is full; and

(e) displaying a character associated with the ASCII string on a screen of the electronic book.

2. The method of claim 1, wherein step (b) further includes the step of searching for a phonetic representation of a word associated with the ASCII string.

3. The method of claim 2, wherein step (e) further includes the step of voicing the phonetic representation.

4. The method of claim 1, further including the steps of:

(i) decompressing an information contained on the removable machine-readable storage medium installed in the electronic book

(ii) reading a special dictionary stored as computer-readable data on the removable machine-readable storage medium installed in the electronic book;

(ii) storing each of a plurality of entries in the special dictionary, in the electronic book; and

(iii) proceeding to step (a).

5. An apparatus for presenting text, comprising:

a book card having a plurality of pointers;
an interface that receives the book card;
a display;
an internal memory having a permanent dictionary having a plurality of words; and
a processor in communication with the interface, the display and the internal memory, and displaying a subset of the plurality of words in the permanent dictionary based upon the plurality of pointers.

6. The apparatus of claim 5, wherein the book card further includes a special dictionary having a plurality of entries.

7. The apparatus of claim 5, wherein the permanent dictionary has an index and a phonetic representation for each of the plurality of words.

8. A method of storing text, comprising the steps of:

(a) converting a plurality of text strings to a plurality of pointers, wherein the pointers comprises a plurality of data bits; and
(b) compressing the plurality of data bits used to form the plurality of pointers.

9. The method of claim 8, wherein step (a) further comprises the steps of:

(a1) determining for each of the plurality of text strings is contained in a permanent dictionary;
(a2) when a text string in the plurality of text strings is contained in the permanent dictionary, converting the text string to a pointer;
(a3) when the text string is not in the permanent dictionary, determining if the text string is in a special dictionary; and

(a4) when the text string is in the special dictionary; converting the text string to a pointer.

10. The method of claim 8, wherein step (b) further includes the steps of:

(b1) performing a statistical analysis of the plurality of data bits;

(b2) creating a code table based on the statistical analysis; and

(b3) compressing the plurality of data bits using the code table.

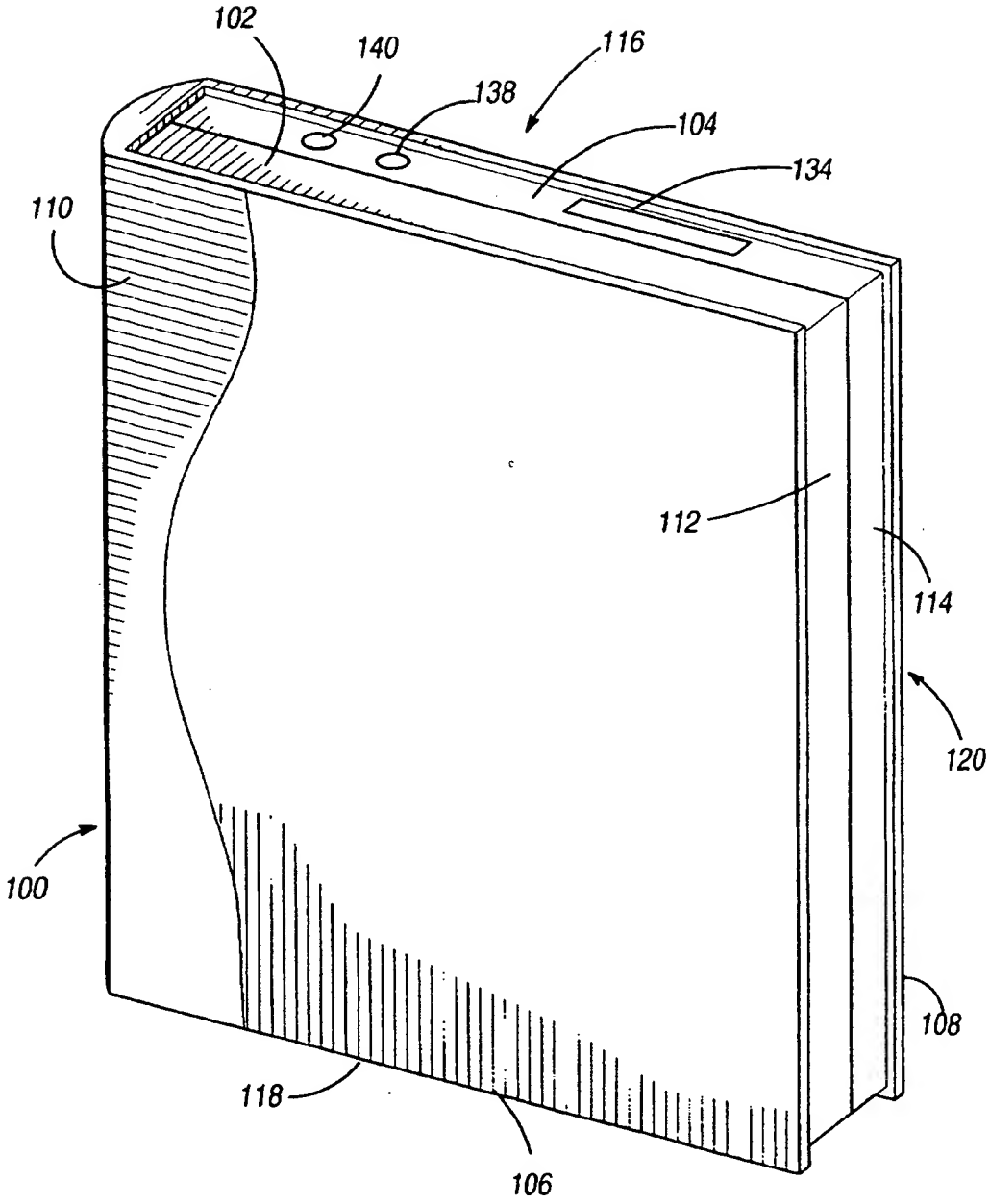

FIG.1

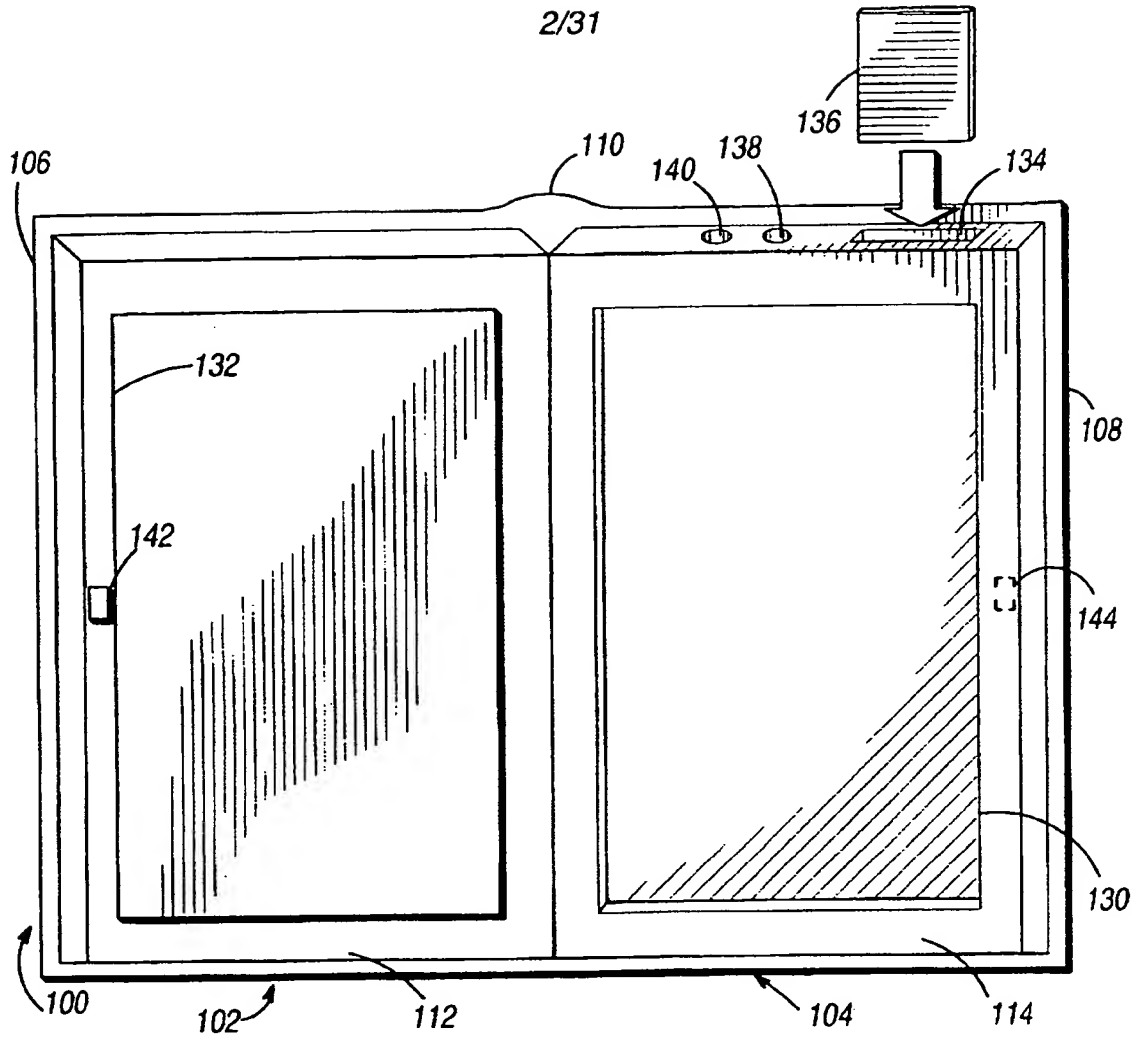
136
106
110
140
138
134
132
108
142
144
130
100
102
112
104
114

FIG.2

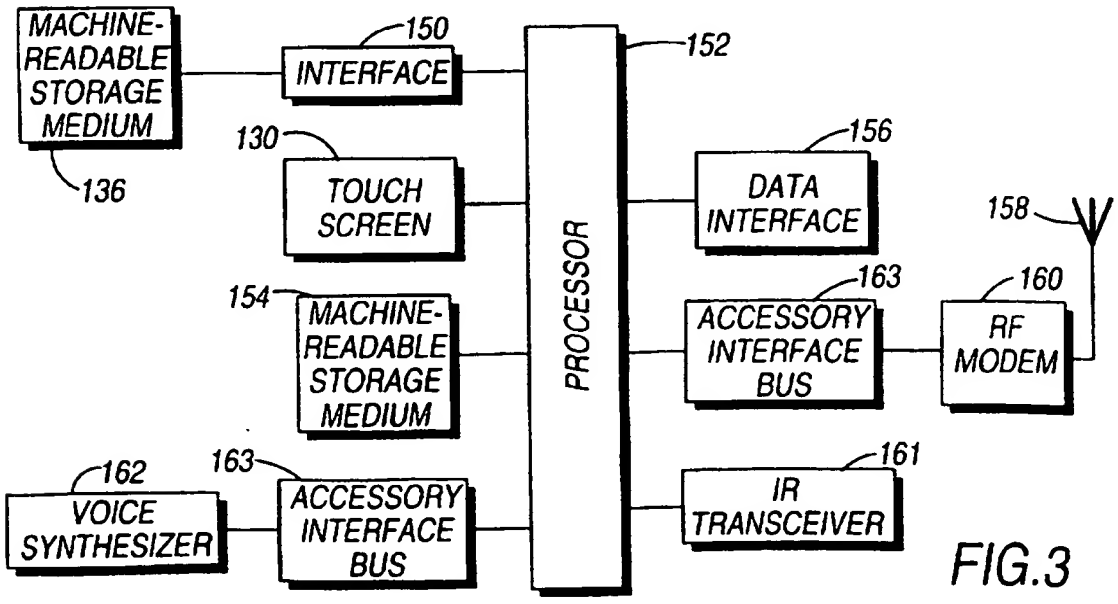
MACHINE-READABLE STORAGE MEDIUM
136
150
INTERFACE
152
130
TOUCH SCREEN
156
DATA INTERFACE
158
154
MACHINE-READABLE STORAGE MEDIUM
PROCESSOR
163
ACCESSORY INTERFACE BUS
160
RF MODEM
162
VOICE SYNTHESIZER
163
ACCESSORY INTERFACE BUS
161
IR TRANSCEIVER

FIG.3

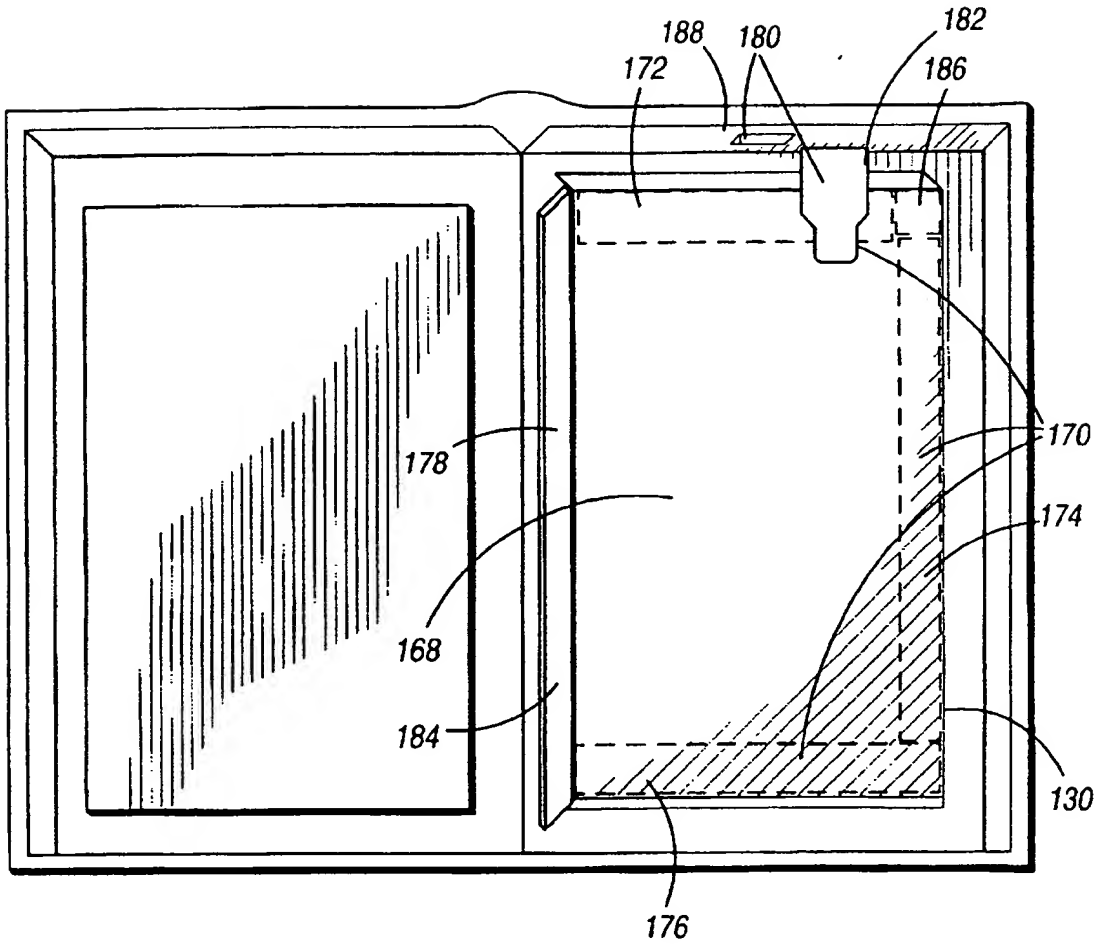

FIG.4

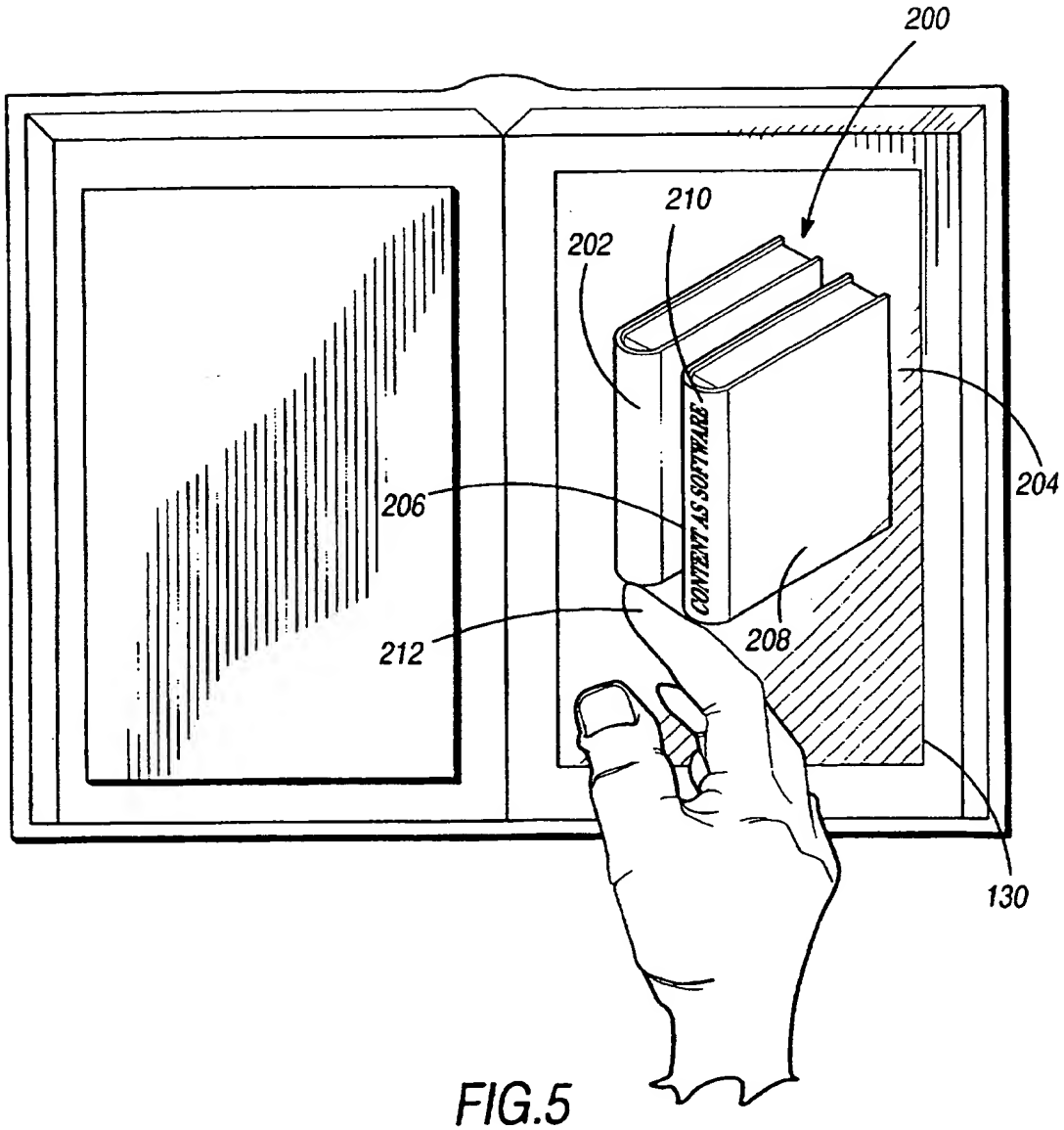

FIG.5

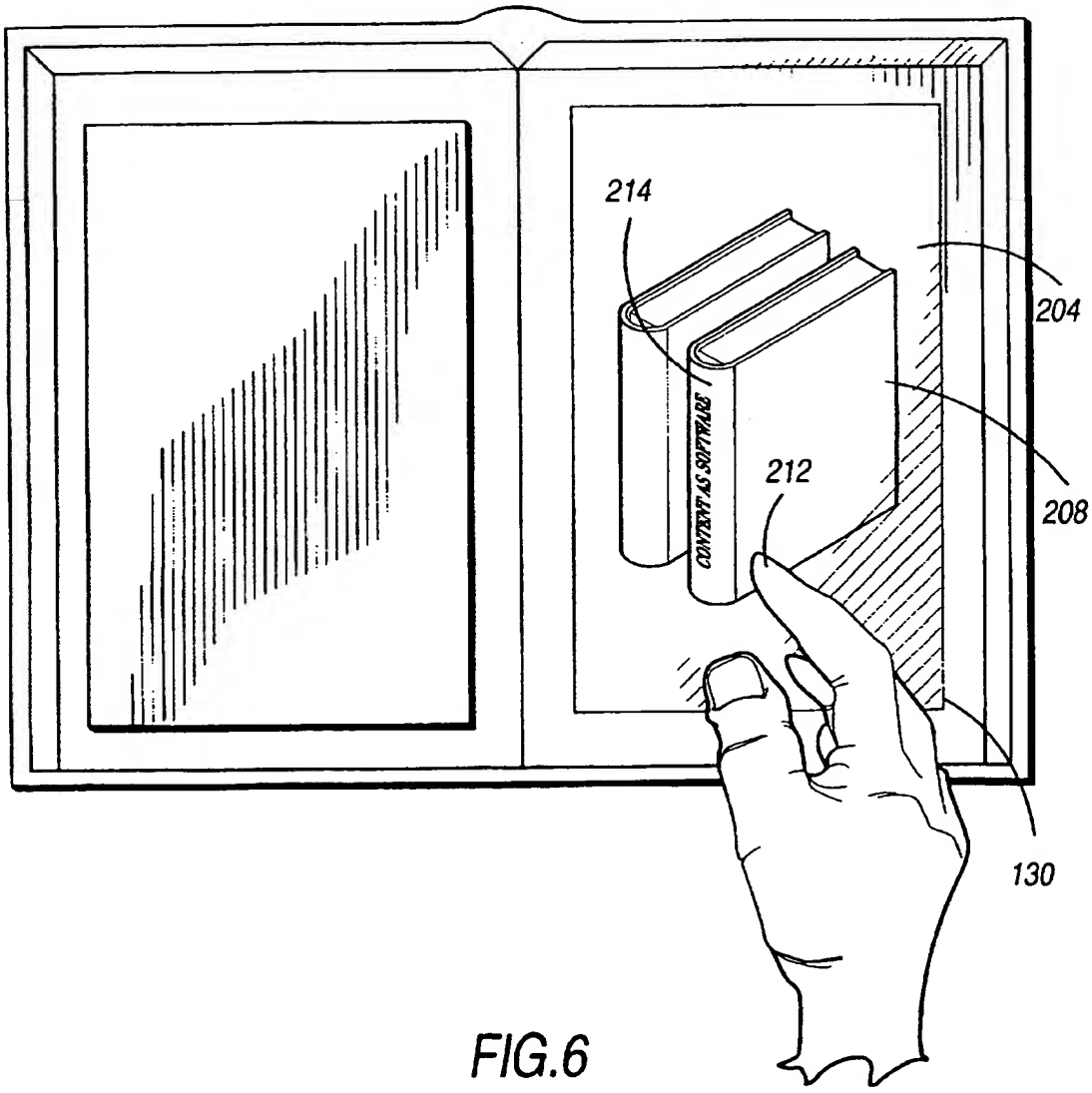

FIG.6

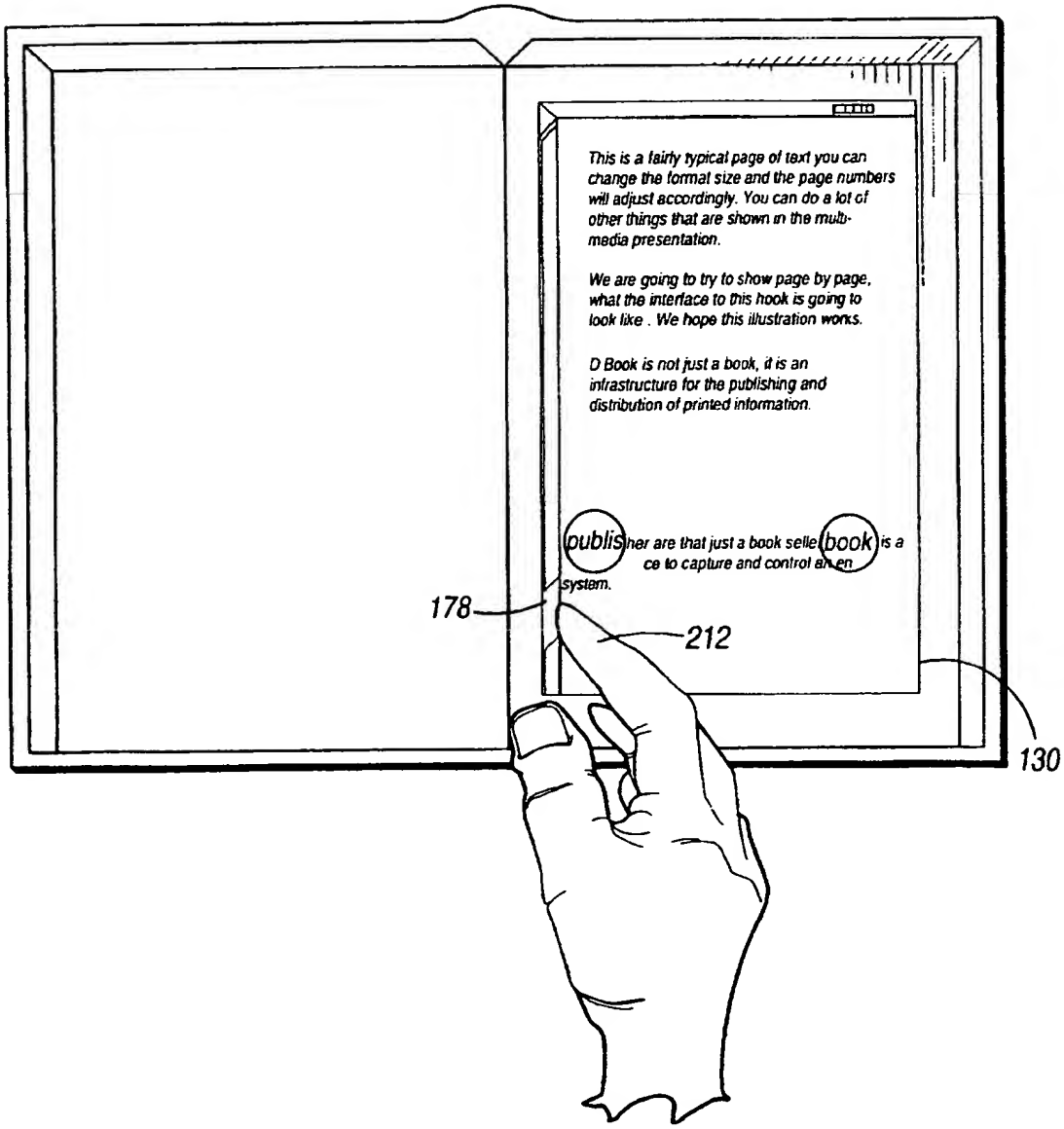
This is a fairly typical page of text you can change the format size and the page numbers will adjust accordingly. You can do a lot of other things that are shown in the multi-media presentation.
We are going to try to show page by page, what the interface to this book is going to look like . We hope this illustration works.
D Book is not just a book, it is an infrastructure for the publishing and distribution of printed information.
publisher are that just a book seller book is a ce to capture and control an en
system.
178
212
130

FIG.7

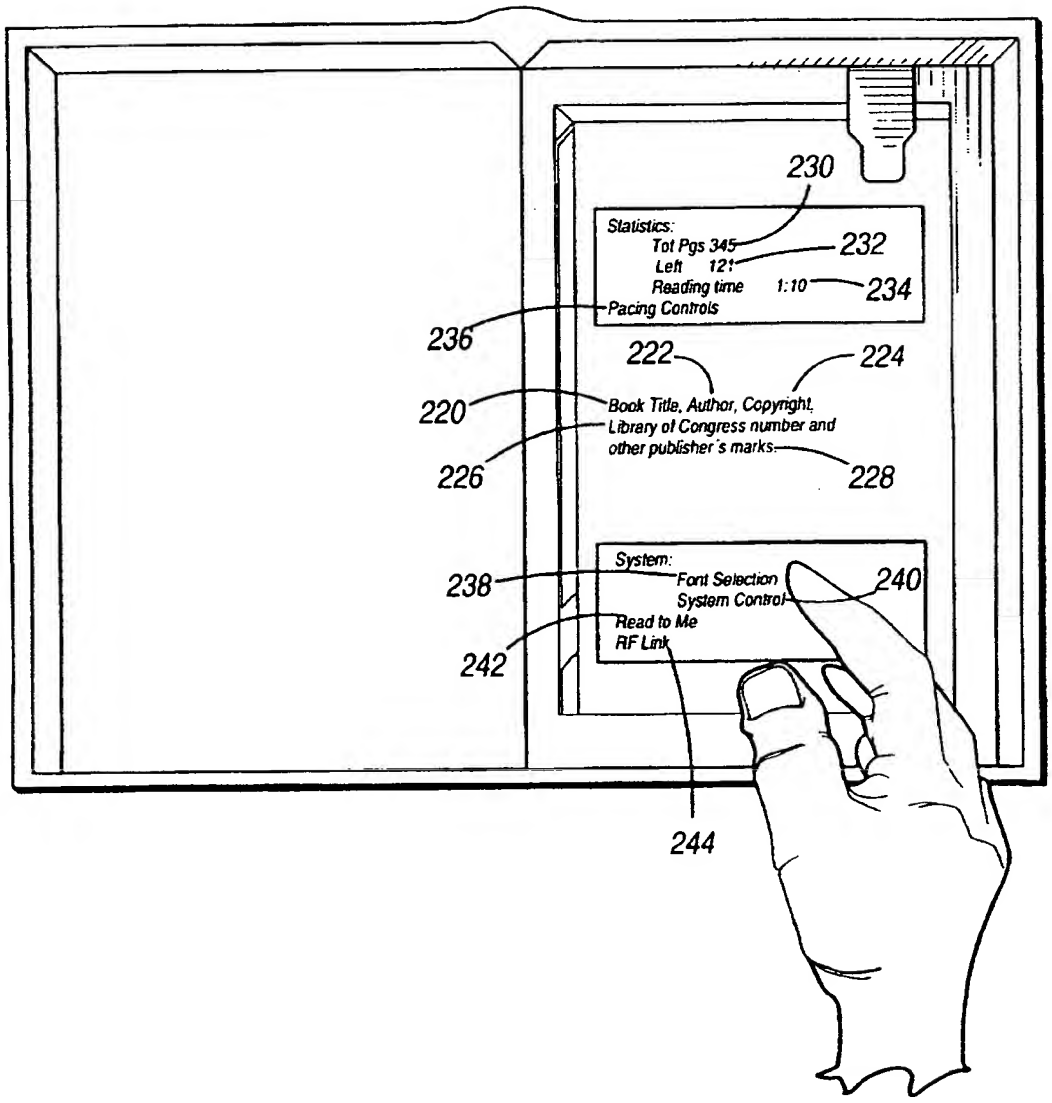
230
Statistics:
Tot Pgs 345
232
Left 121
Reading time 1:10
234
Pacing Controls
236
222
224
220
Book Title, Author, Copyright,
Library of Congress number and
other publisher's marks
226
228
System:
238
Font Selection
240
System Control
Read to Me
242
RF Link
244

FIG.8

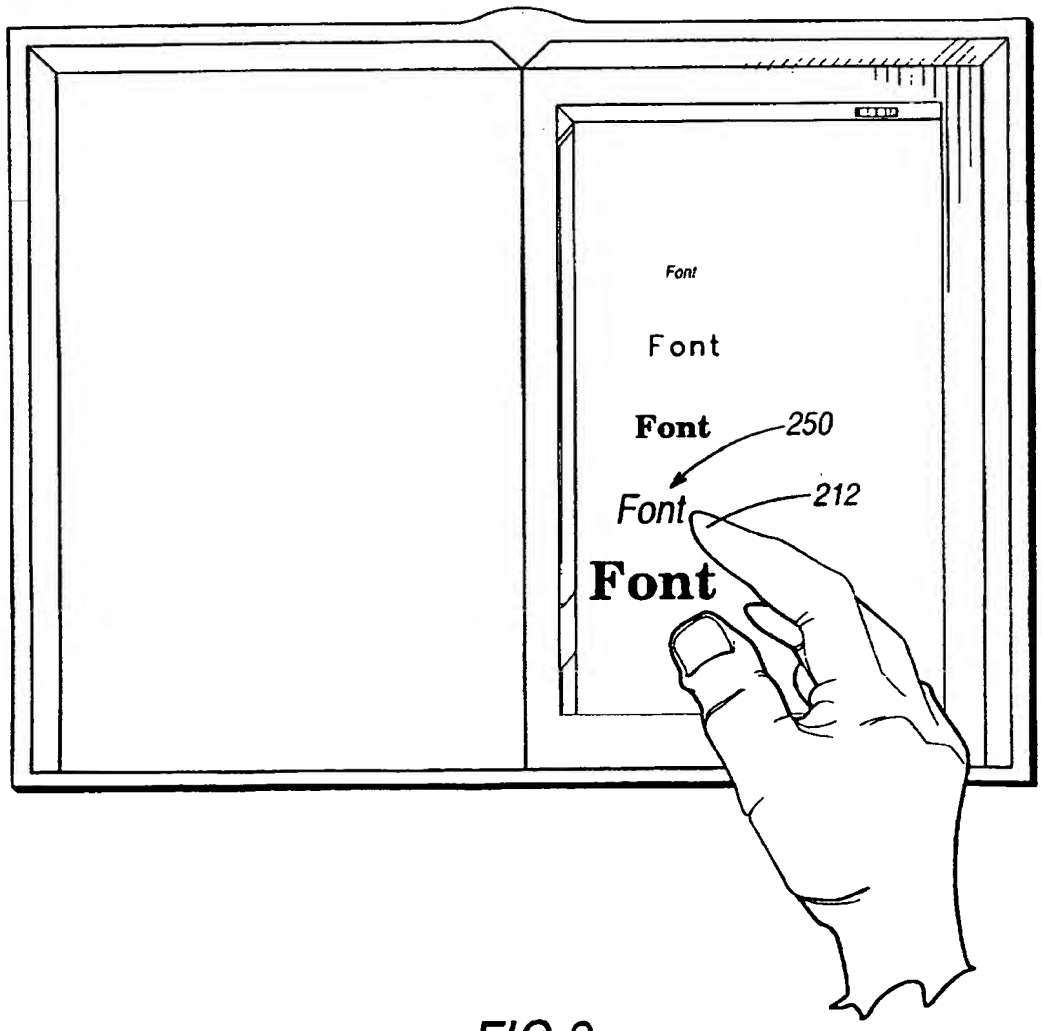

FIG.9

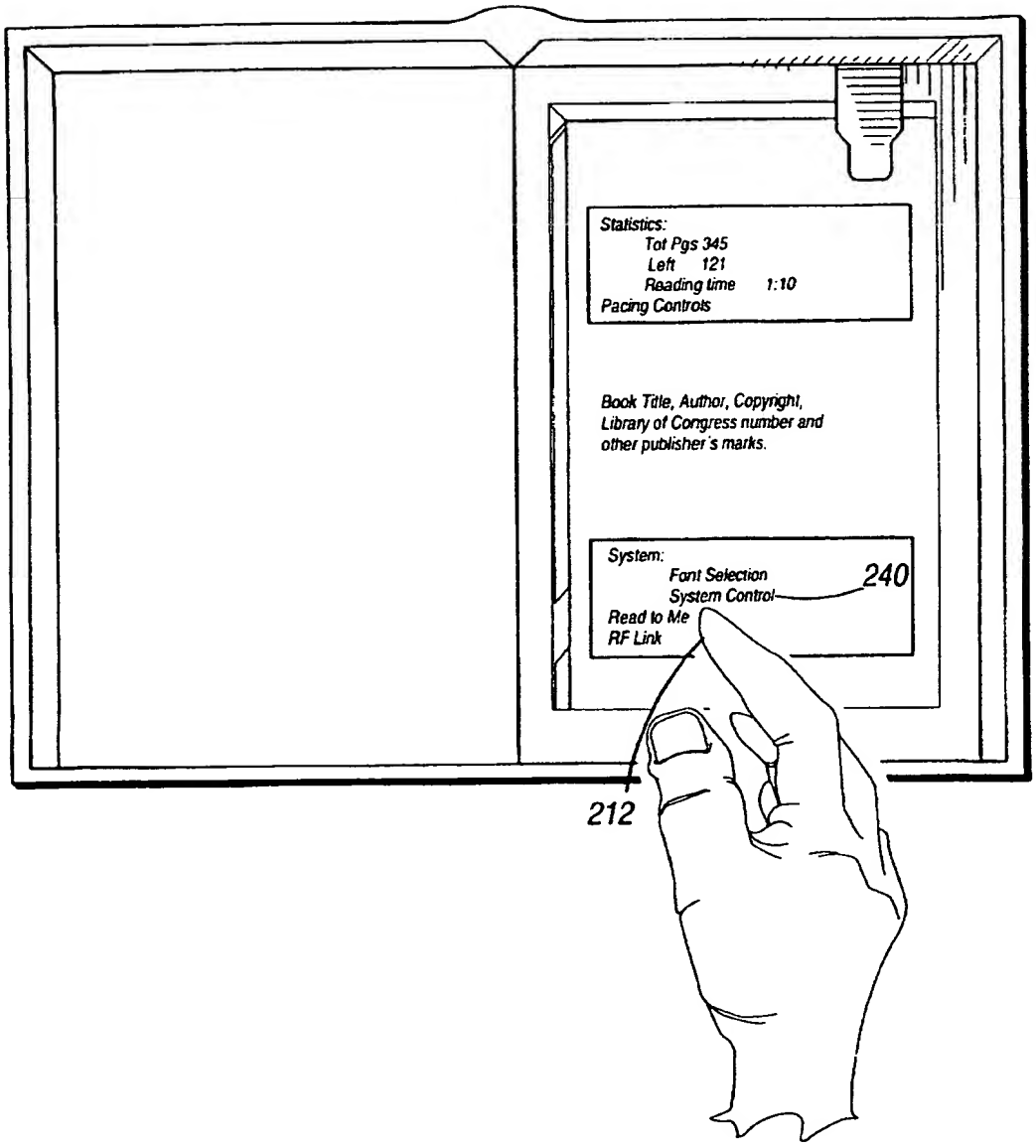
Statistics:
Tot Pgs 345
Left 121
Reading time 1:10
Pacing Controls
Book Title, Author, Copyright, Library of Congress number and other publisher's marks.
System:
Font Selection
System Control
240
Read to Me
RF Link
212

FIG.10

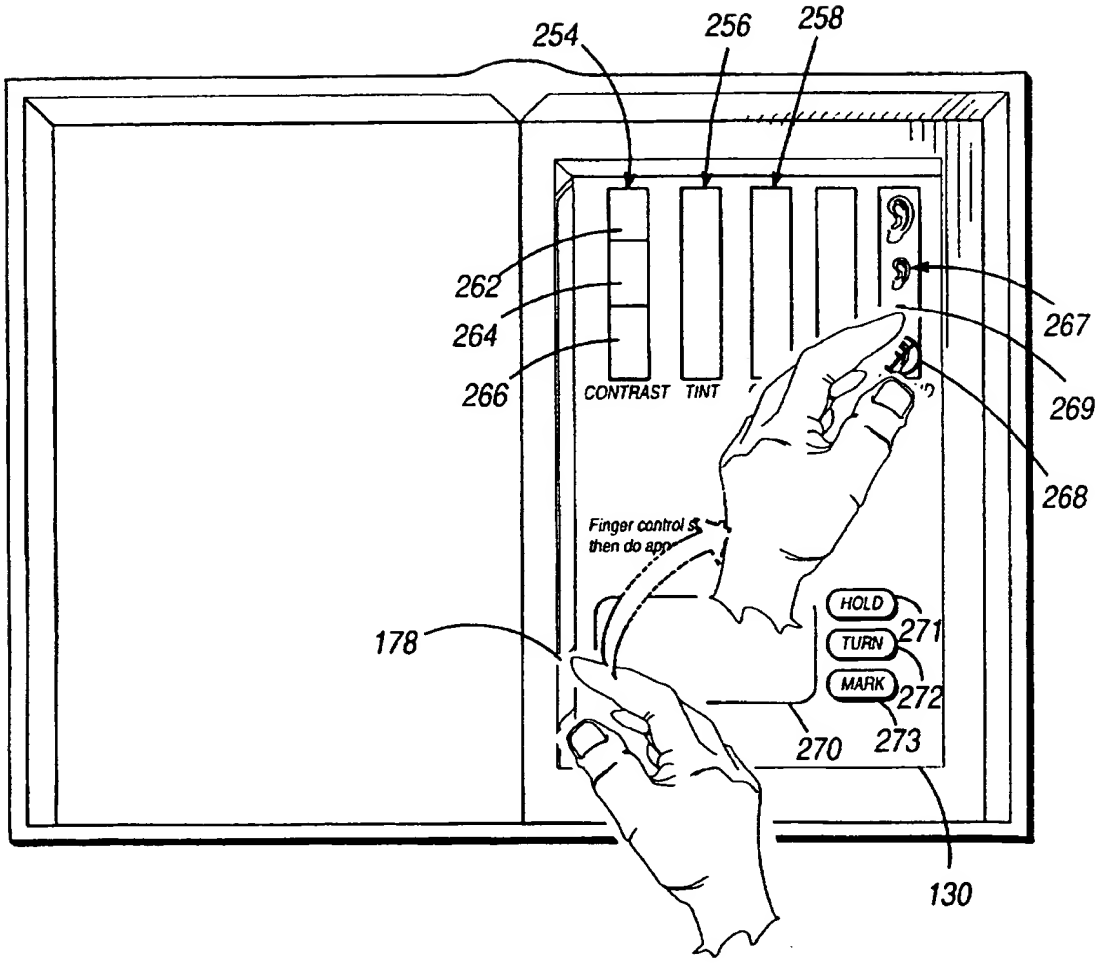
254
256
258
262
264
266
CONTRAST
TINT
267
269
268
Finger control
then do
178
HOLD
TURN
MARK
271
272
273
270
130

FIG.11

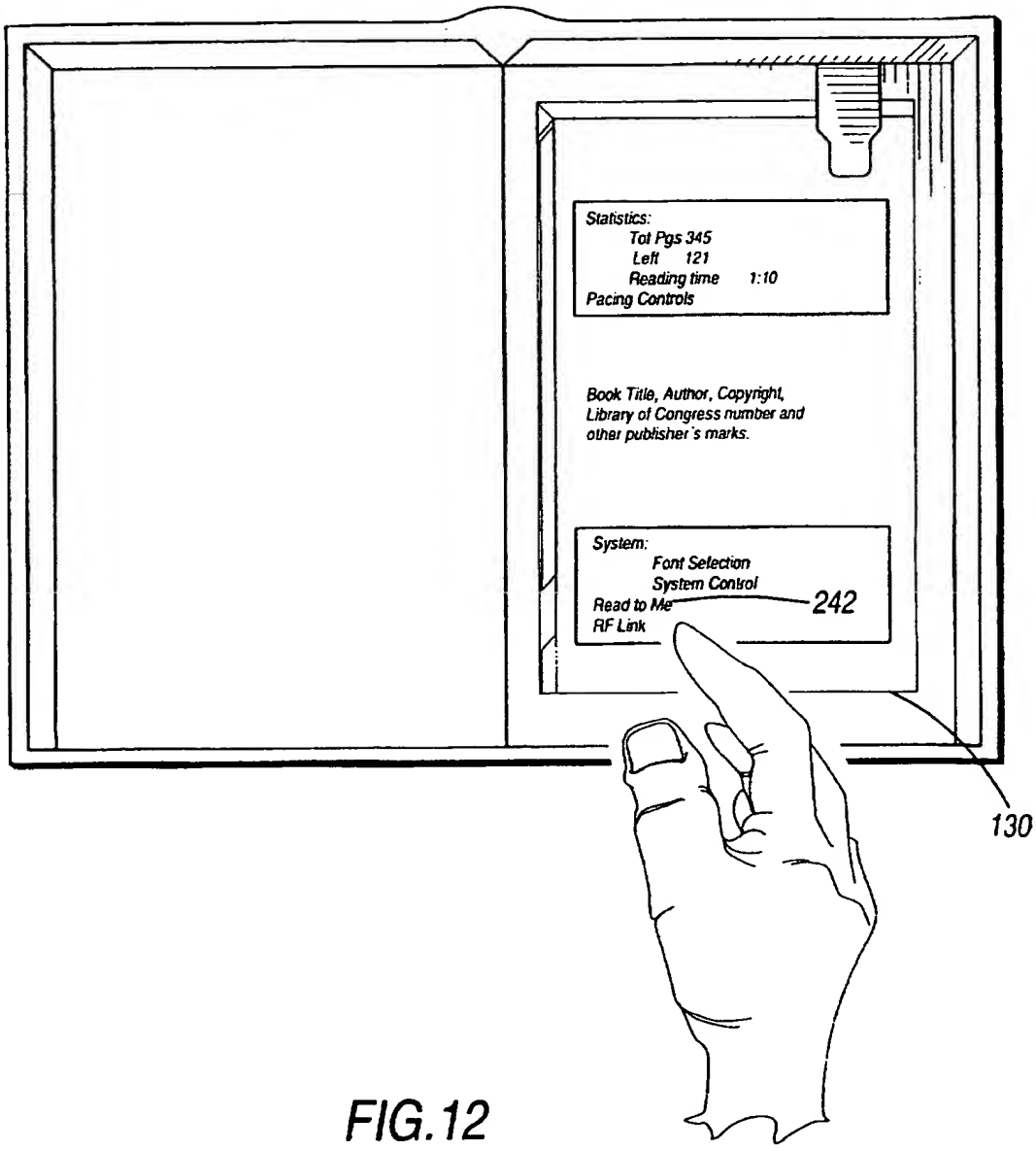
Statistics:
Tot Pgs 345
Left 121
Reading time 1:10
Pacing Controls
Book Title, Author, Copyright, Library of Congress number and other publisher's marks.
System:
Font Selection
System Control
Read to Me
RF Link
242
130

FIG.12

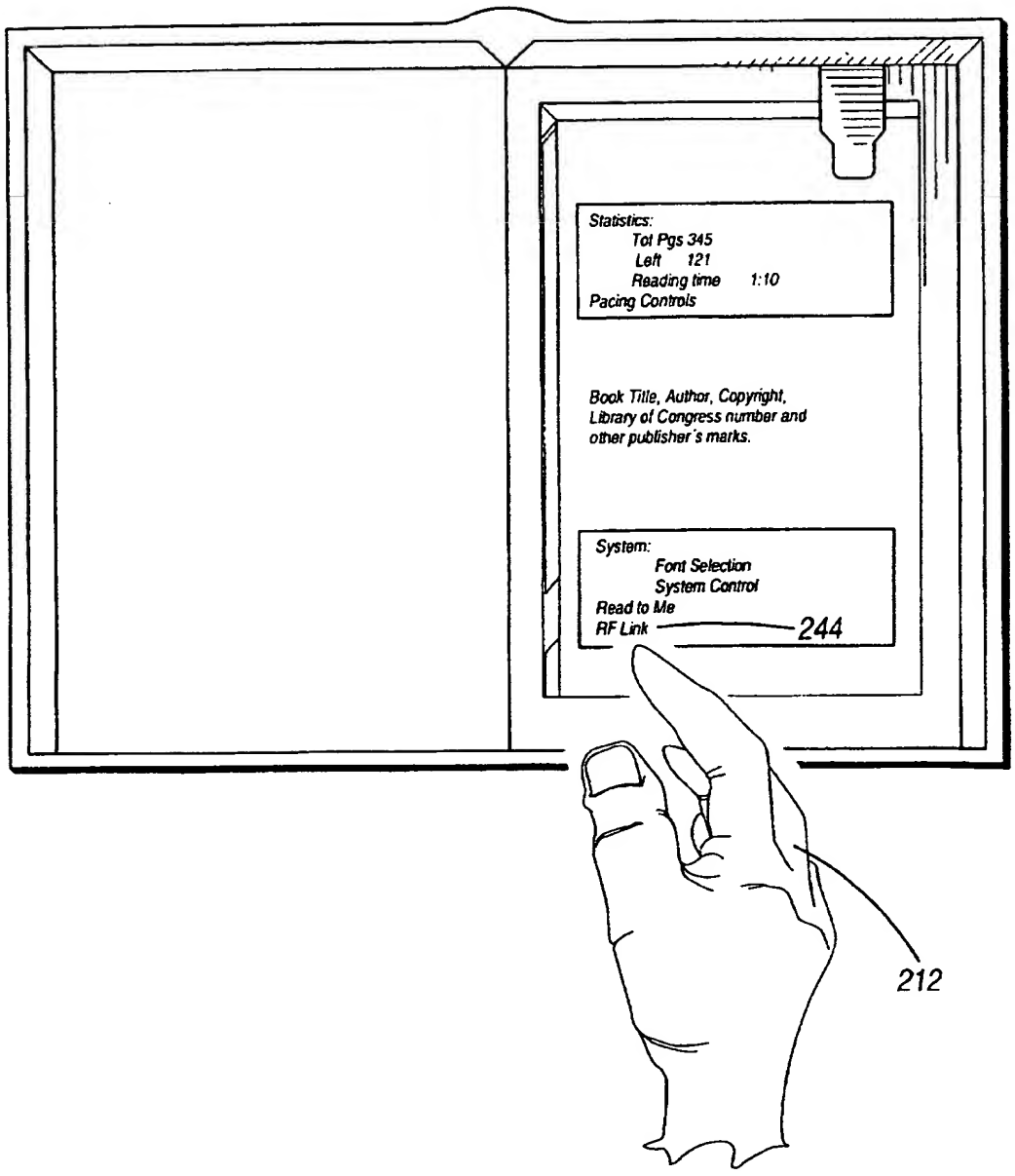
Statistics:
Tot Pgs 345
Left 121
Reading time 1:10
Pacing Controls
Book Title, Author, Copyright, Library of Congress number and other publisher's marks.
System:
Font Selection
System Control
Read to Me
RF Link
244
212

FIG.13

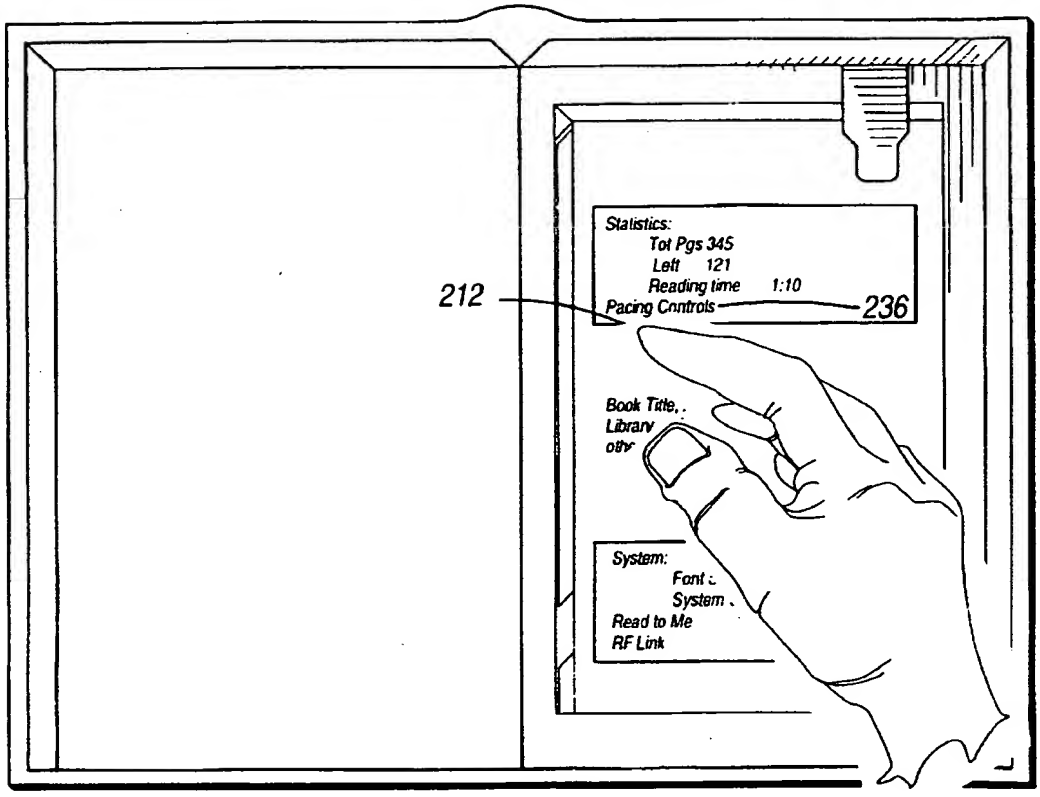
212
Statistics:
Tot Pgs 345
Left 121
Reading time 1:10
Pacing Controls
236
Book Title, .
Library
other
System:
Font :
System .
Read to Me
RF Link

FIG.14

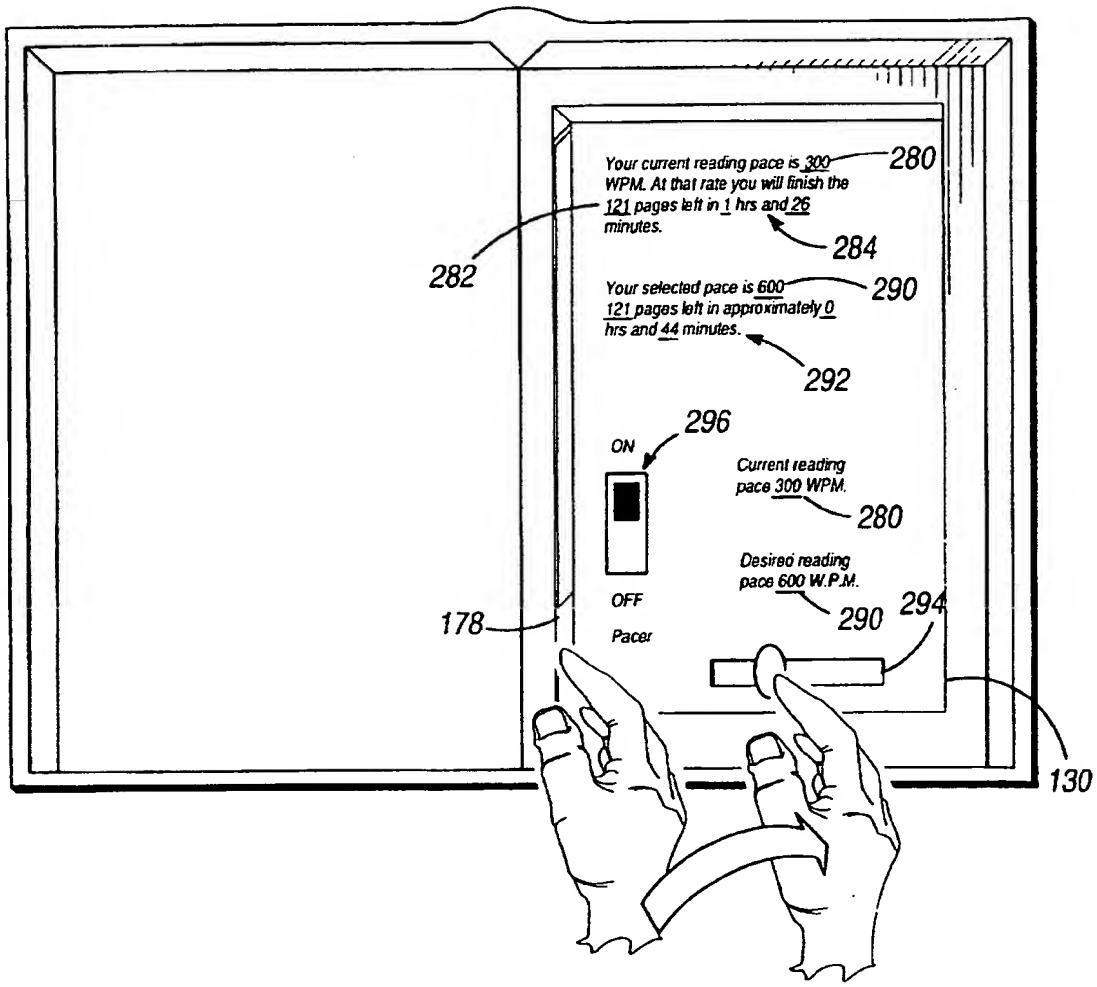
Your current reading pace is 300 WPM. At that rate you will finish the 121 pages left in 1 hrs and 26 minutes.
280
282
284
Your selected pace is 600
290
121 pages left in approximately 0 hrs and 44 minutes.
292
296
ON
Current reading pace 300 WPM.
280
OFF
Pacer
Desired reading pace 600 W.P.M.
290
294
178
130

FIG.15

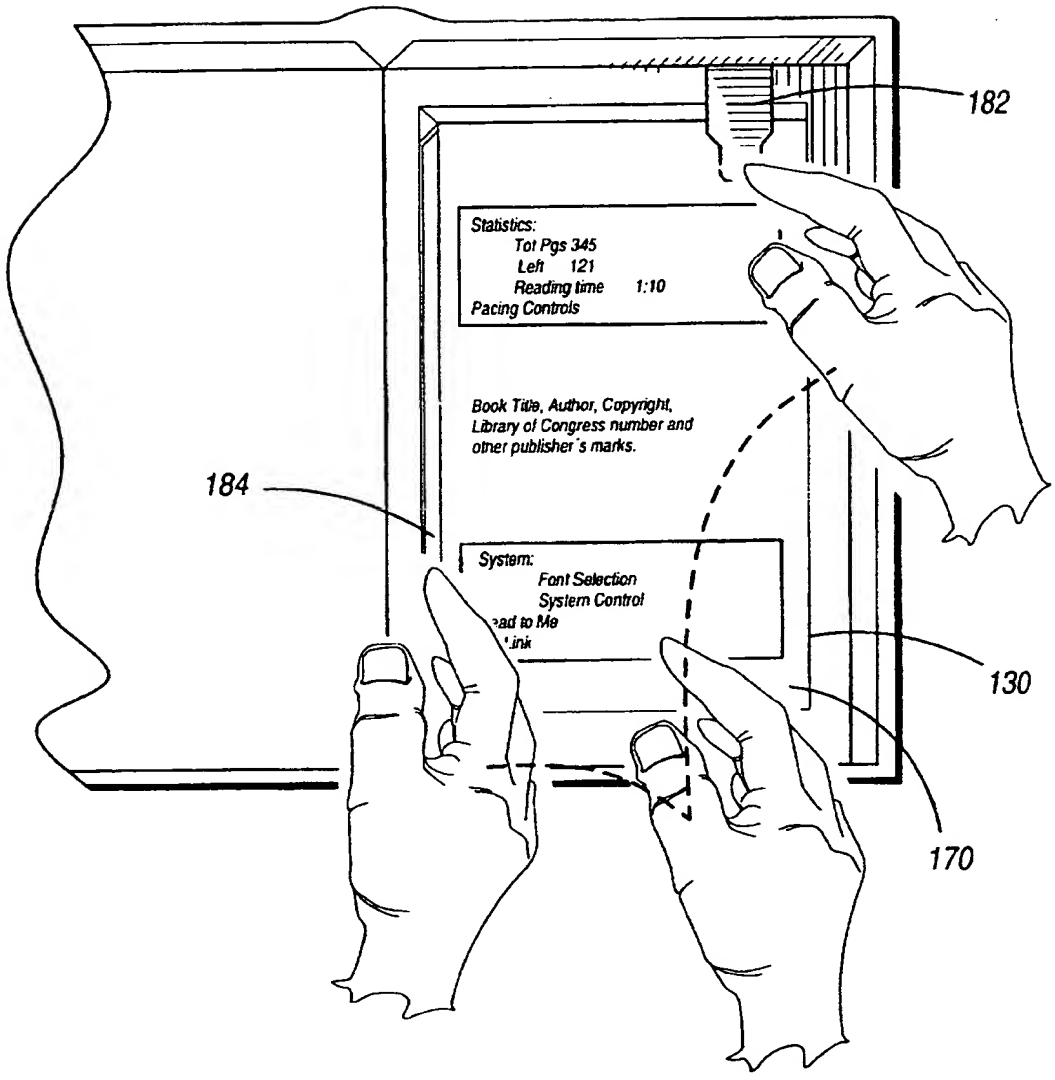
182
Statistics:
Tot Pgs 345
Left 121
Reading time 1:10
Pacing Controls
Book Title, Author, Copyright, Library of Congress number and other publisher's marks.
184
System:
Font Selection
System Control
130
170

FIG.16

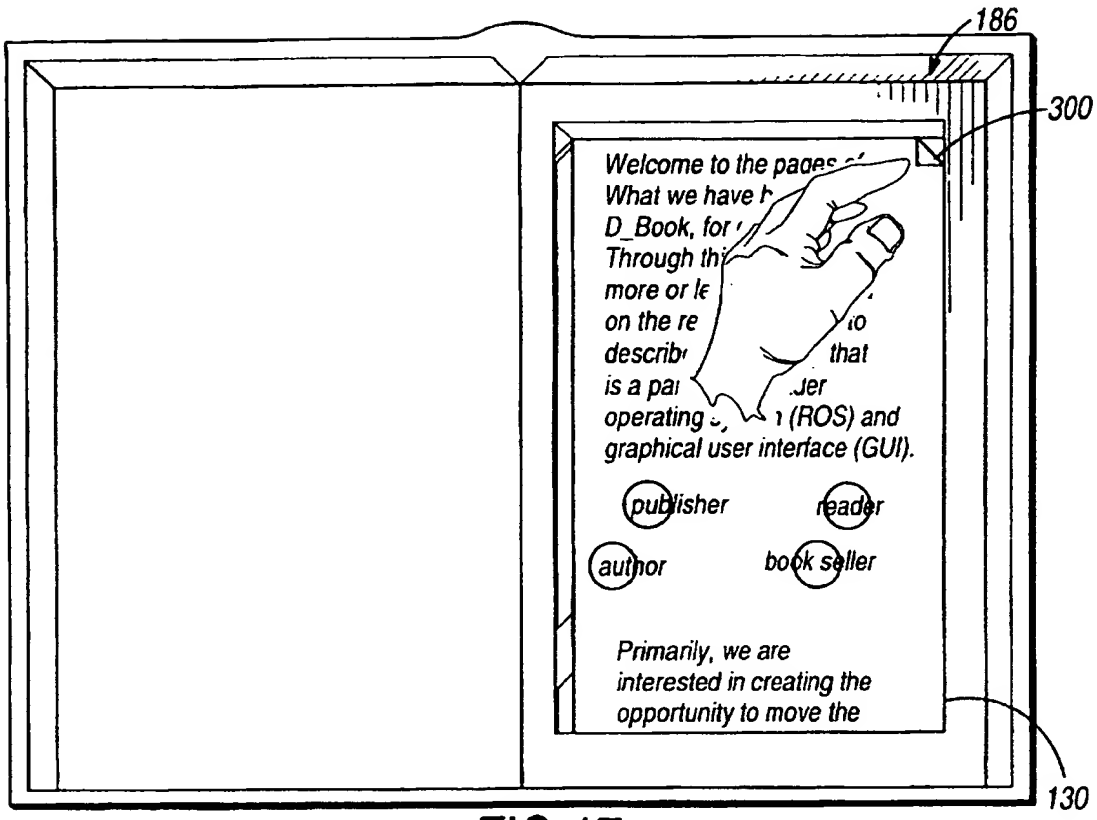
186
300
Welcome to the pages
What we have
D_Book, for
Through th
more or le
on the re
describ
is a pa
operating
(ROS) and
graphical user interface (GUI).
publisher
reader
author
book seller
Primarily, we are
interested in creating the
opportunity to move the
130

FIG.17

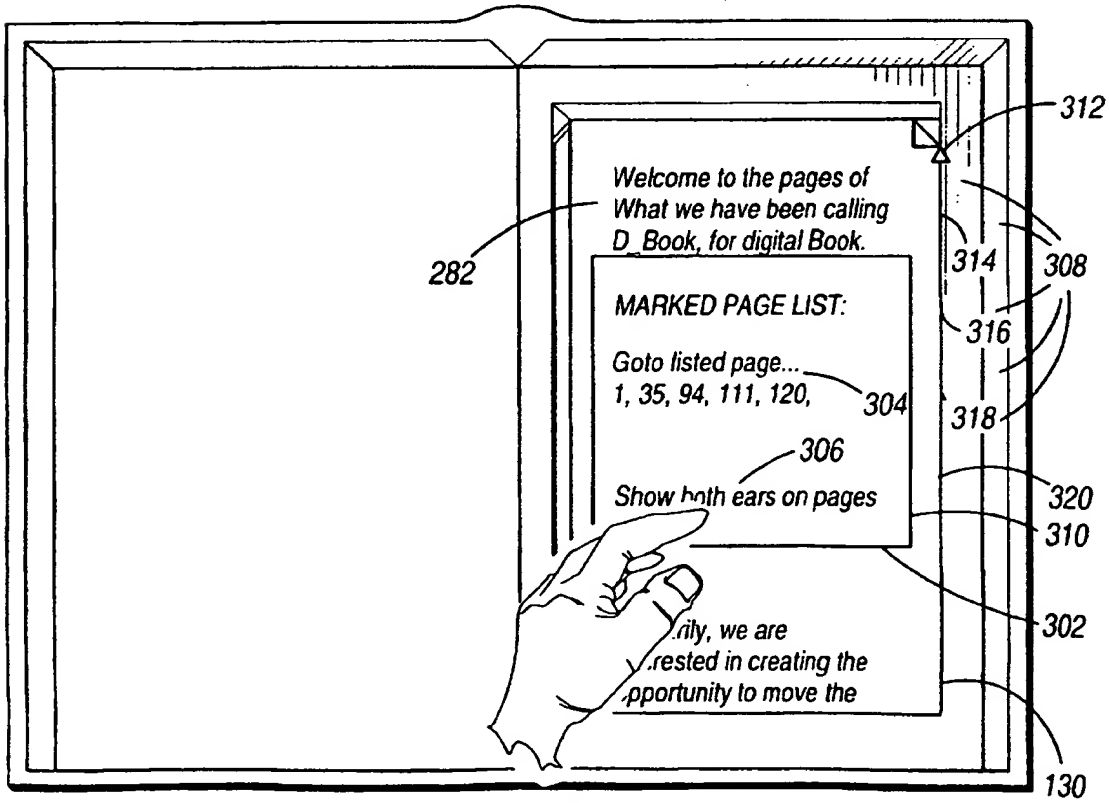
312
Welcome to the pages of
What we have been calling
D_Book, for digital Book.
282
314
308
MARKED PAGE LIST:
316
Goto listed page...
1, 35, 94, 111, 120,
304
318
306
320
Show both ears on pages
310
302
rily, we are
rested in creating the
pportunity to move the
130

FIG.18

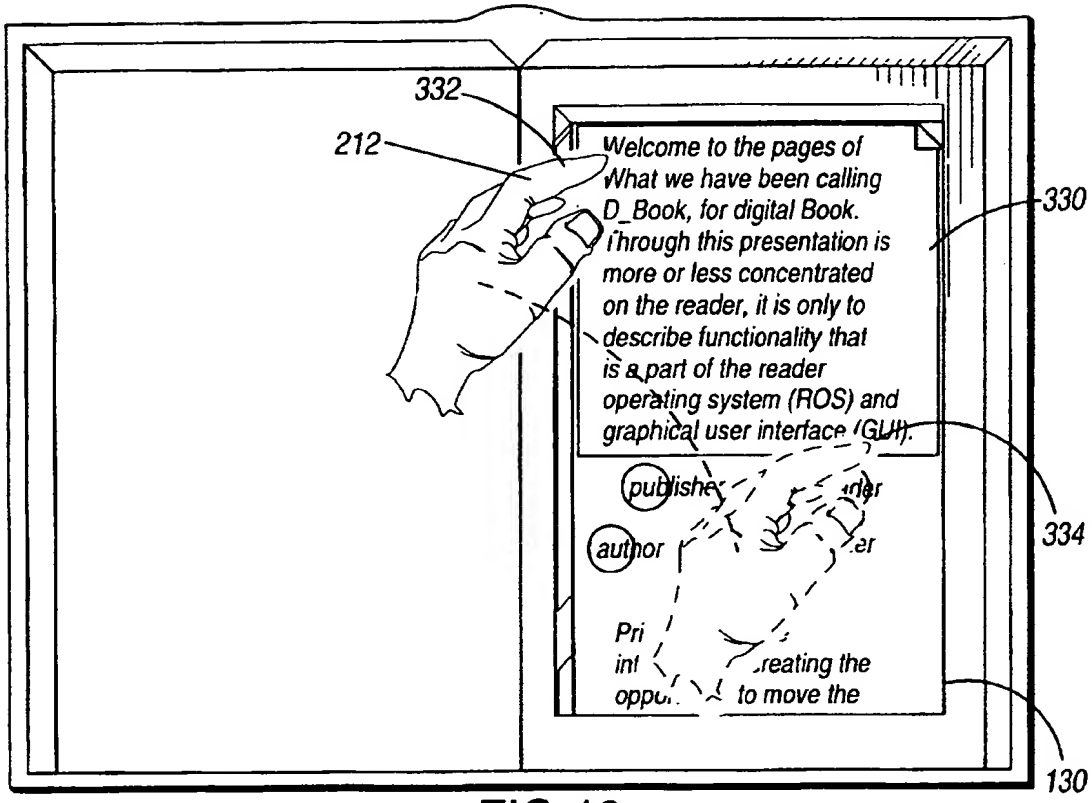
332
212
Welcome to the pages of
What we have been calling
D_Book, for digital Book.
Through this presentation is
more or less concentrated
on the reader, it is only to
describe functionality that
is a part of the reader
operating system (ROS) and
graphical user interface (GUI).
publisher
author
Pri
int reating the
oppo to move the
330
334
130

FIG.19

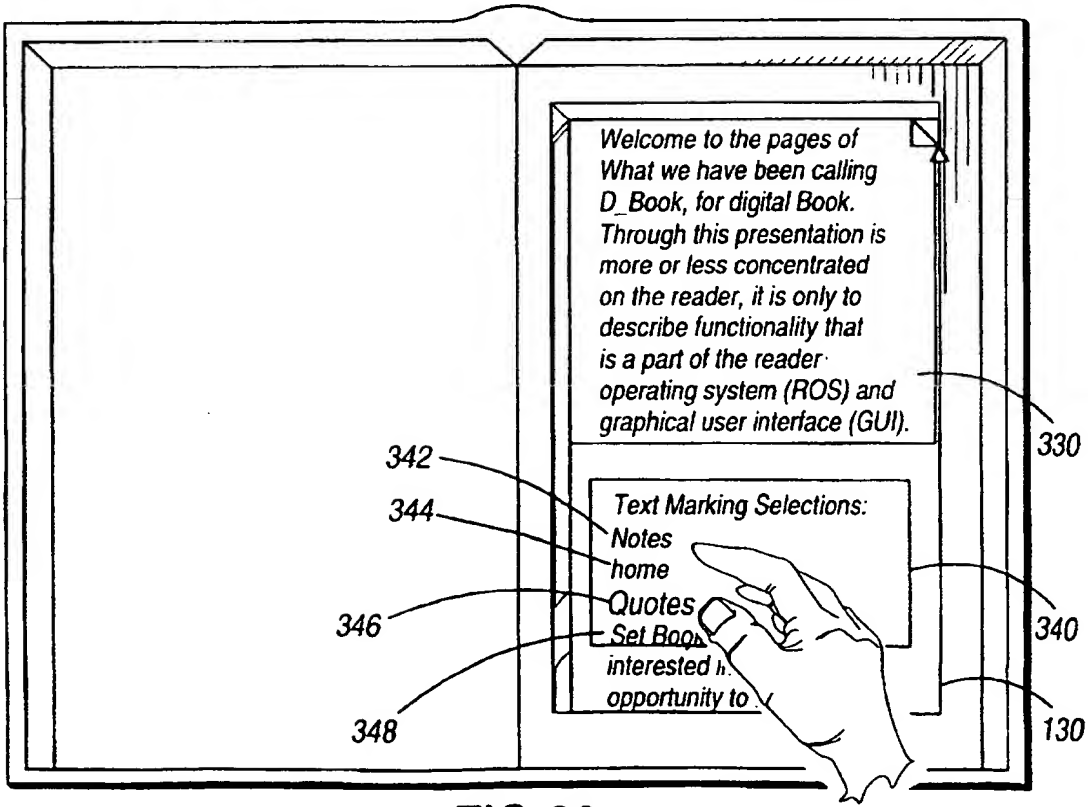
Welcome to the pages of
What we have been calling
D_Book, for digital Book.
Through this presentation is
more or less concentrated
on the reader, it is only to
describe functionality that
is a part of the reader
operating system (ROS) and
graphical user interface (GUI).
342
344
346
348
Text Marking Selections:
Notes
home
Quotes
Set Boo
interested h
opportunity to
330
340
130

FIG.20

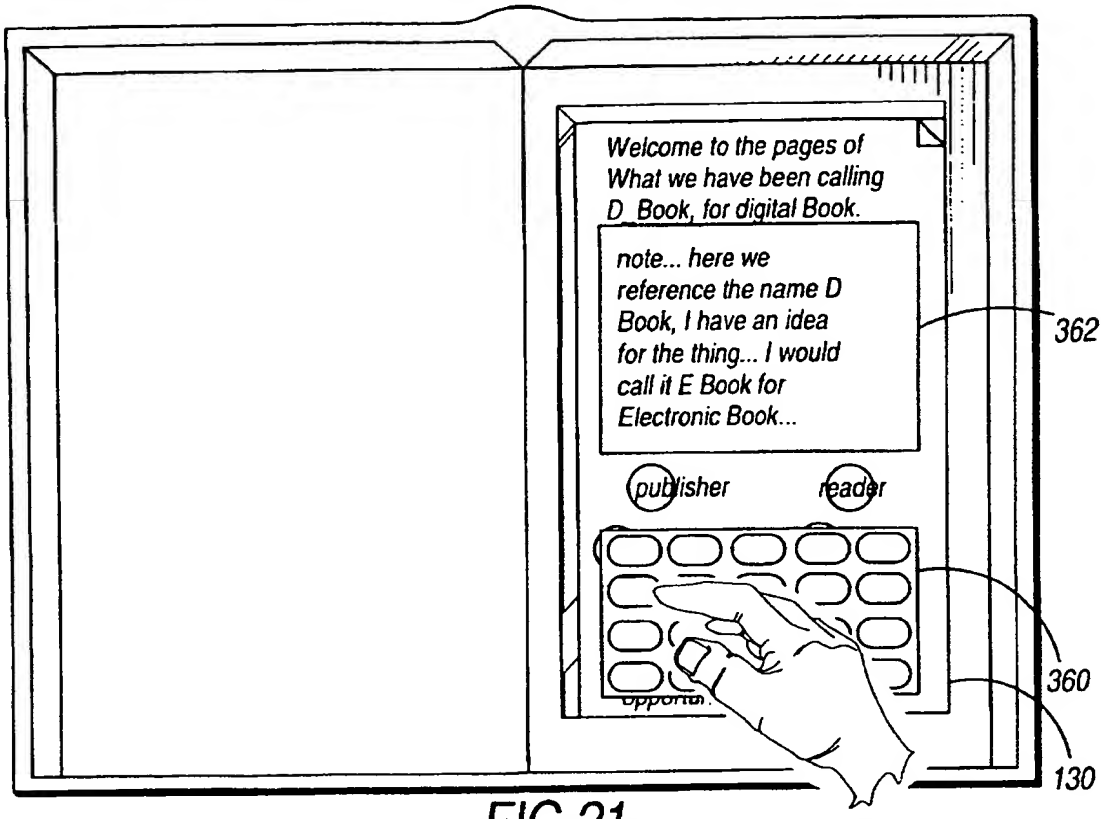
Welcome to the pages of
What we have been calling
D_Book, for digital Book.
note... here we
reference the name D
Book, I have an idea
for the thing... I would
call it E Book for
Electronic Book...
publisher
reader
362
360
130

FIG.21

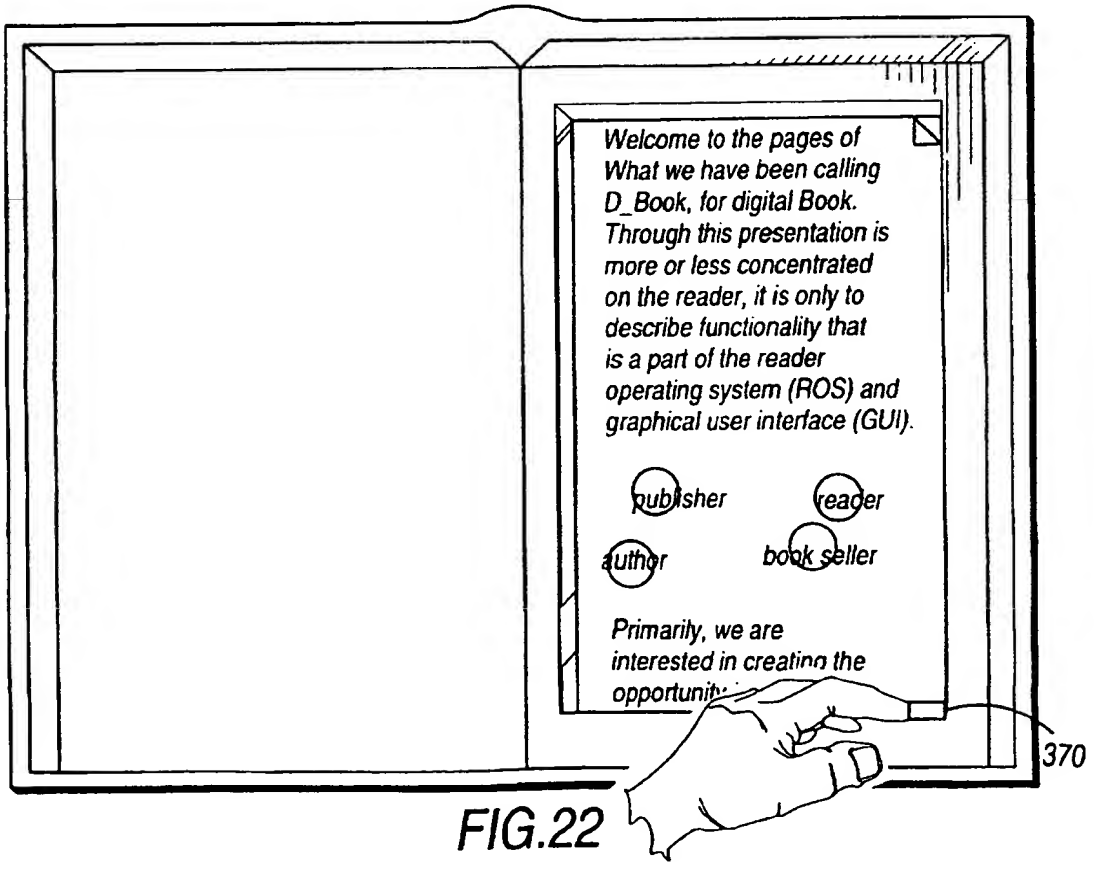
Welcome to the pages of
What we have been calling
D_Book, for digital Book.
Through this presentation is
more or less concentrated
on the reader, it is only to
describe functionality that
is a part of the reader
operating system (ROS) and
graphical user interface (GUI).
publisher
reader
author
book seller
Primarily, we are
interested in creating the
370

FIG.22

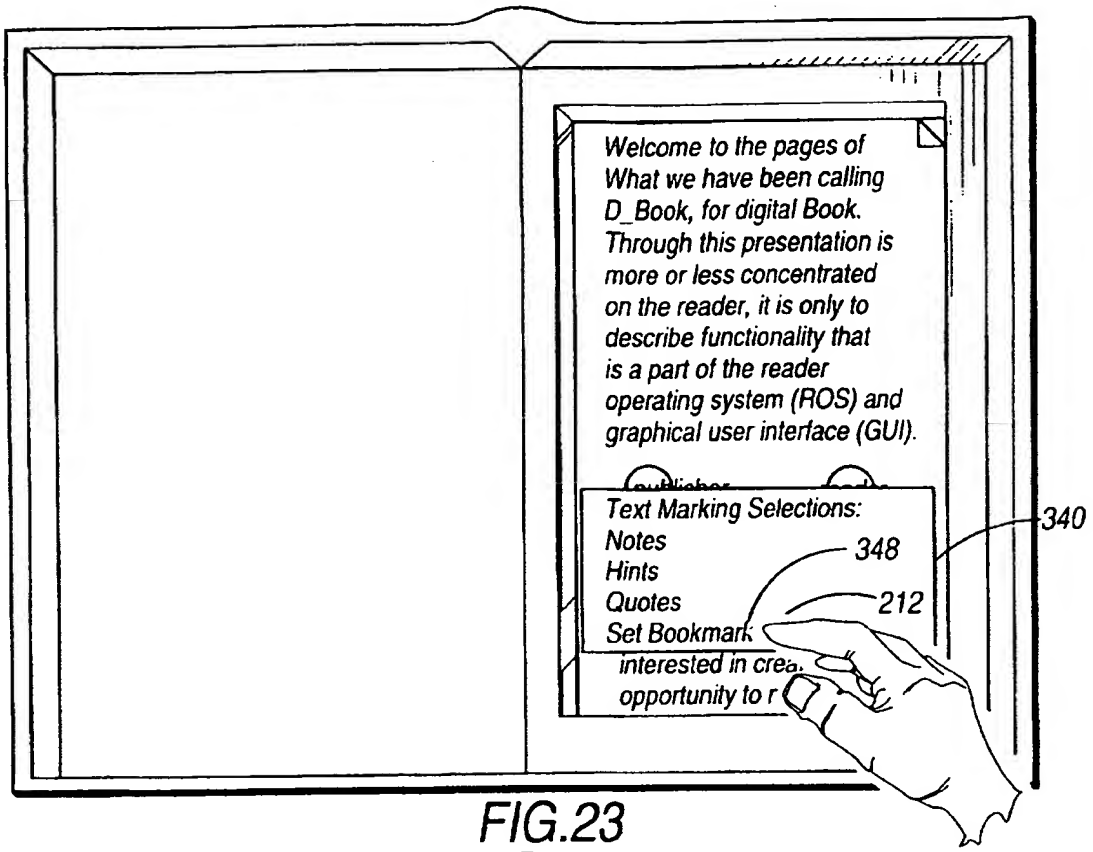
Welcome to the pages of
What we have been calling
D_Book, for digital Book.
Through this presentation is
more or less concentrated
on the reader, it is only to
describe functionality that
is a part of the reader
operating system (ROS) and
graphical user interface (GUI).
Text Marking Selections:
Notes
Hints
Quotes
Set Bookmark
interested in crea
opportunity to r
340
348
212

FIG.23

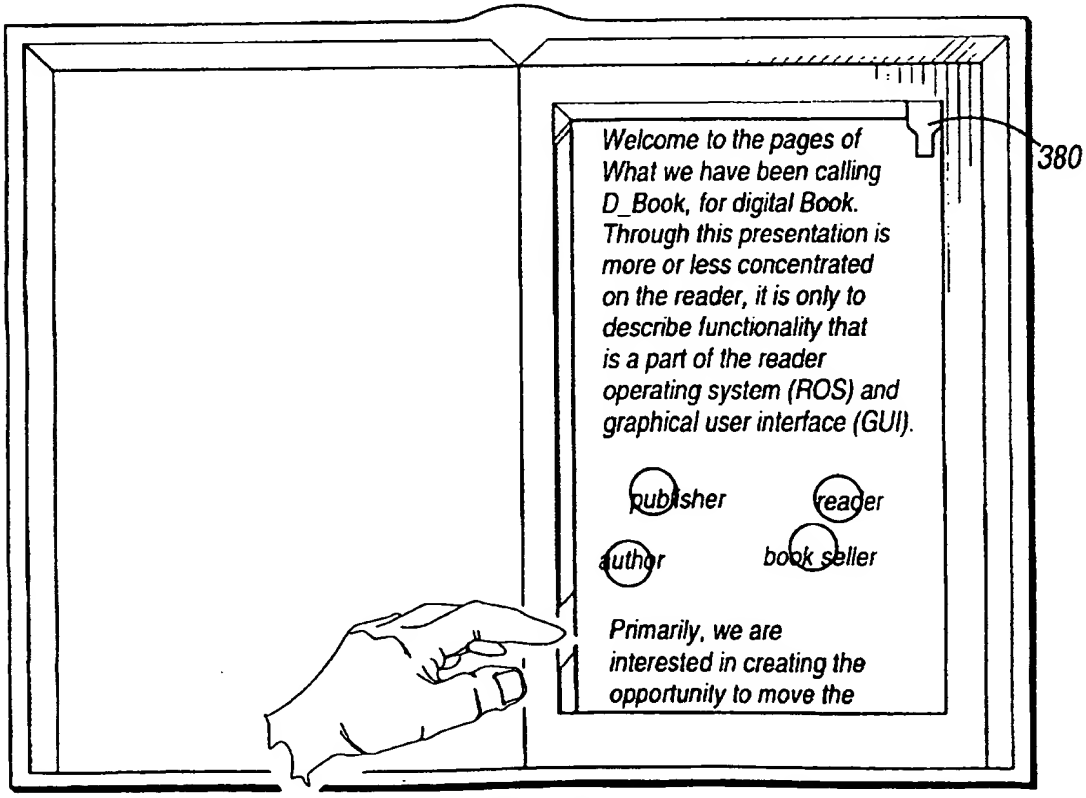
Welcome to the pages of
What we have been calling
D_Book, for digital Book.
Through this presentation is
more or less concentrated
on the reader, it is only to
describe functionality that
is a part of the reader
operating system (ROS) and
graphical user interface (GUI).
publisher
reader
author
book seller
Primarily, we are
interested in creating the
opportunity to move the
380

FIG.24

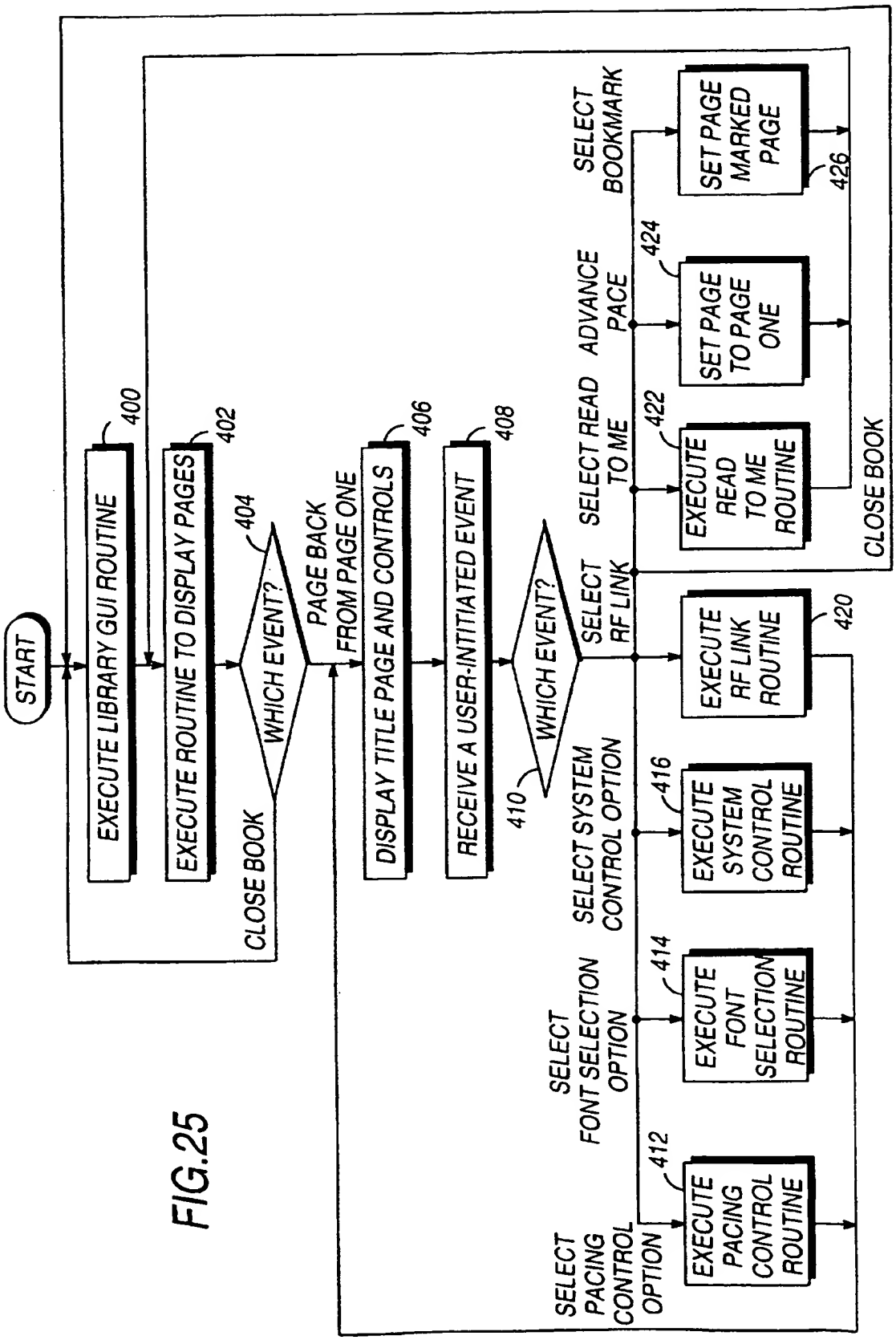
START
EXECUTE LIBRARY GUI ROUTINE
400
EXECUTE ROUTINE TO DISPLAY PAGES
402
WHICH EVENT?
404
CLOSE BOOK
PAGE BACK FROM PAGE ONE
DISPLAY TITLE PAGE AND CONTROLS
406
RECEIVE A USER-INITIATED EVENT
408
WHICH EVENT?
410
SELECT PACING CONTROL OPTION
EXECUTE PACING CONTROL ROUTINE
412
SELECT FONT SELECTION OPTION
EXECUTE FONT SELECTION ROUTINE
414
SELECT SYSTEM CONTROL OPTION
EXECUTE SYSTEM CONTROL ROUTINE
416
SELECT RF LINK
EXECUTE RF LINK ROUTINE
420
SELECT READ TO ME
EXECUTE READ TO ME ROUTINE
422
ADVANCE PACE
SET PAGE TO PAGE ONE
424
SELECT BOOKMARK
SET PAGE MARKED PAGE
426
CLOSE BOOK

FIG.25

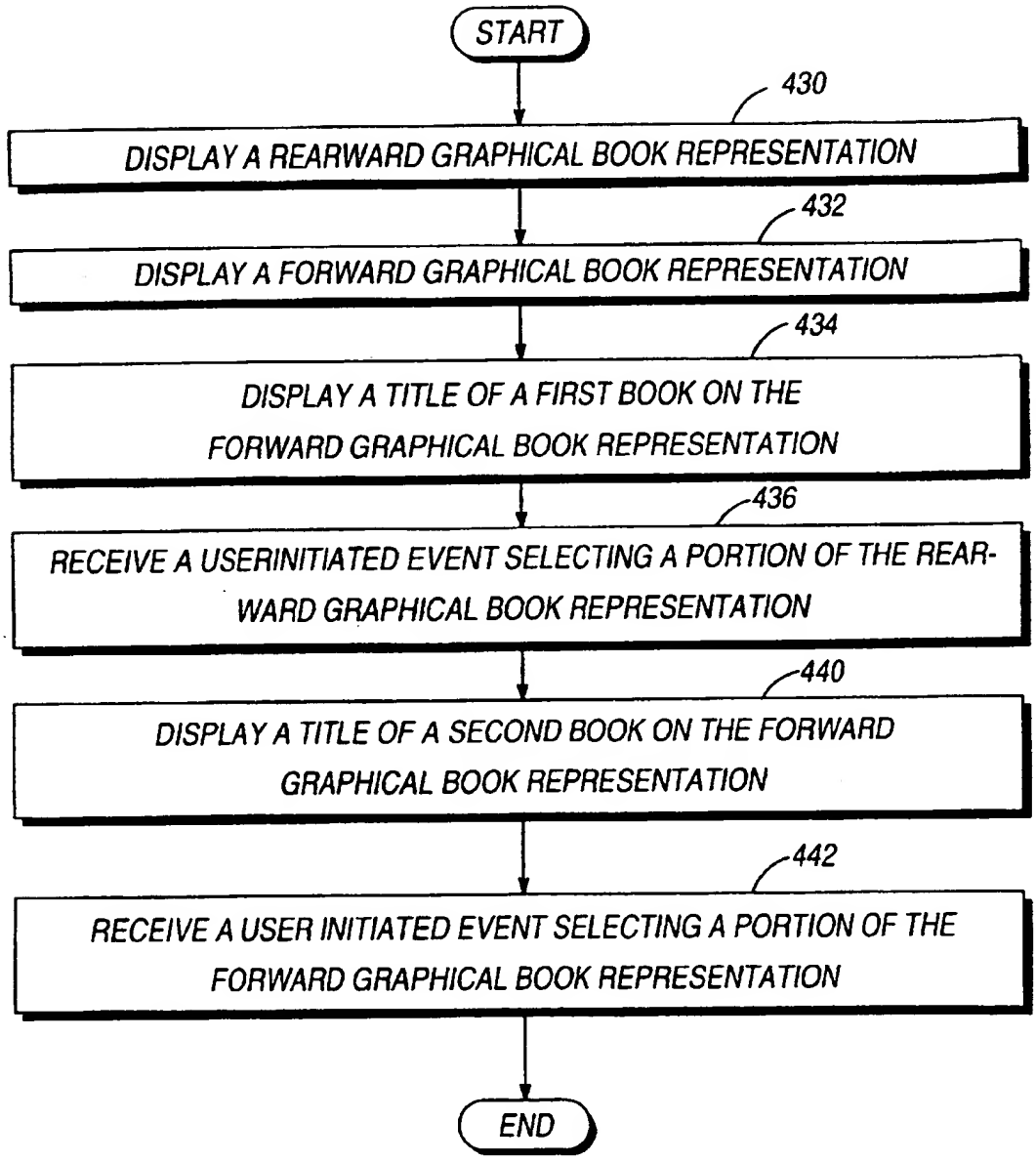
START
430
DISPLAY A REARWARD GRAPHICAL BOOK REPRESENTATION
432
DISPLAY A FORWARD GRAPHICAL BOOK REPRESENTATION
434
DISPLAY A TITLE OF A FIRST BOOK ON THE FORWARD GRAPHICAL BOOK REPRESENTATION
436
RECEIVE A USERINITIATED EVENT SELECTING A PORTION OF THE REARWARD GRAPHICAL BOOK REPRESENTATION
440
DISPLAY A TITLE OF A SECOND BOOK ON THE FORWARD GRAPHICAL BOOK REPRESENTATION
442
RECEIVE A USER INITIATED EVENT SELECTING A PORTION OF THE FORWARD GRAPHICAL BOOK REPRESENTATION
END

FIG.26

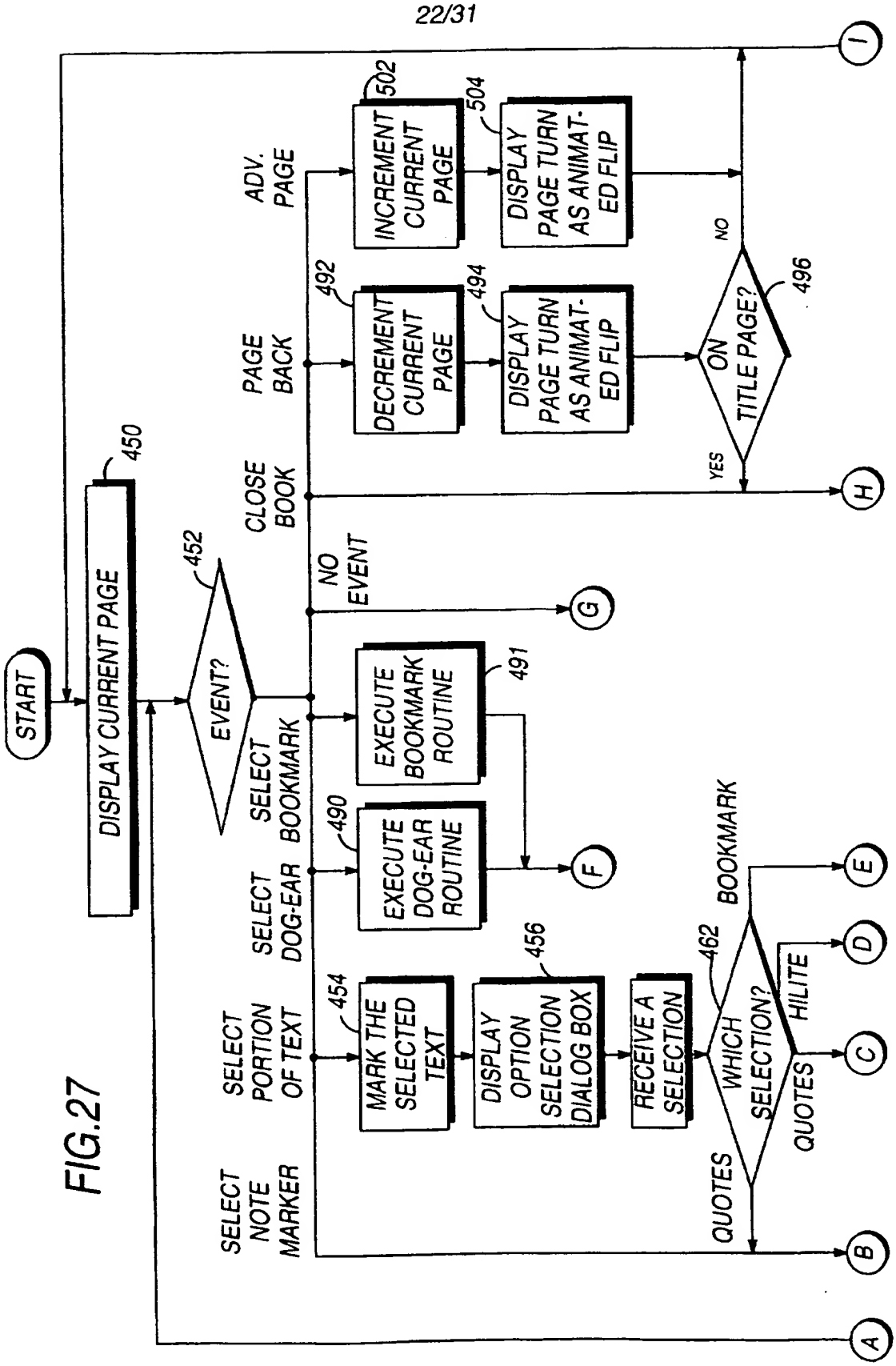
START
DISPLAY CURRENT PAGE
450
EVENT?
452
SELECT BOOKMARK
SELECT DOG-EAR
SELECT PORTION OF TEXT
SELECT NOTE MARKER
CLOSE BOOK
PAGE BACK
ADV. PAGE
NO EVENT
EXECUTE BOOKMARK ROUTINE
491
EXECUTE DOG-EAR ROUTINE
490
MARK THE SELECTED TEXT
454
DISPLAY OPTION SELECTION DIALOG BOX
456
RECEIVE A SELECTION
462
WHICH SELECTION?
BOOKMARK
HILITE
QUOTES
QUOTES
DECREMENT CURRENT PAGE
492
DISPLAY PAGE TURN AS ANIMAT-ED FLIP
494
INCREMENT CURRENT PAGE
502
DISPLAY PAGE TURN AS ANIMAT-ED FLIP
504
ON TITLE PAGE?
496
YES
NO
A
B
C
D
E
F
G
H
I

FIG.27

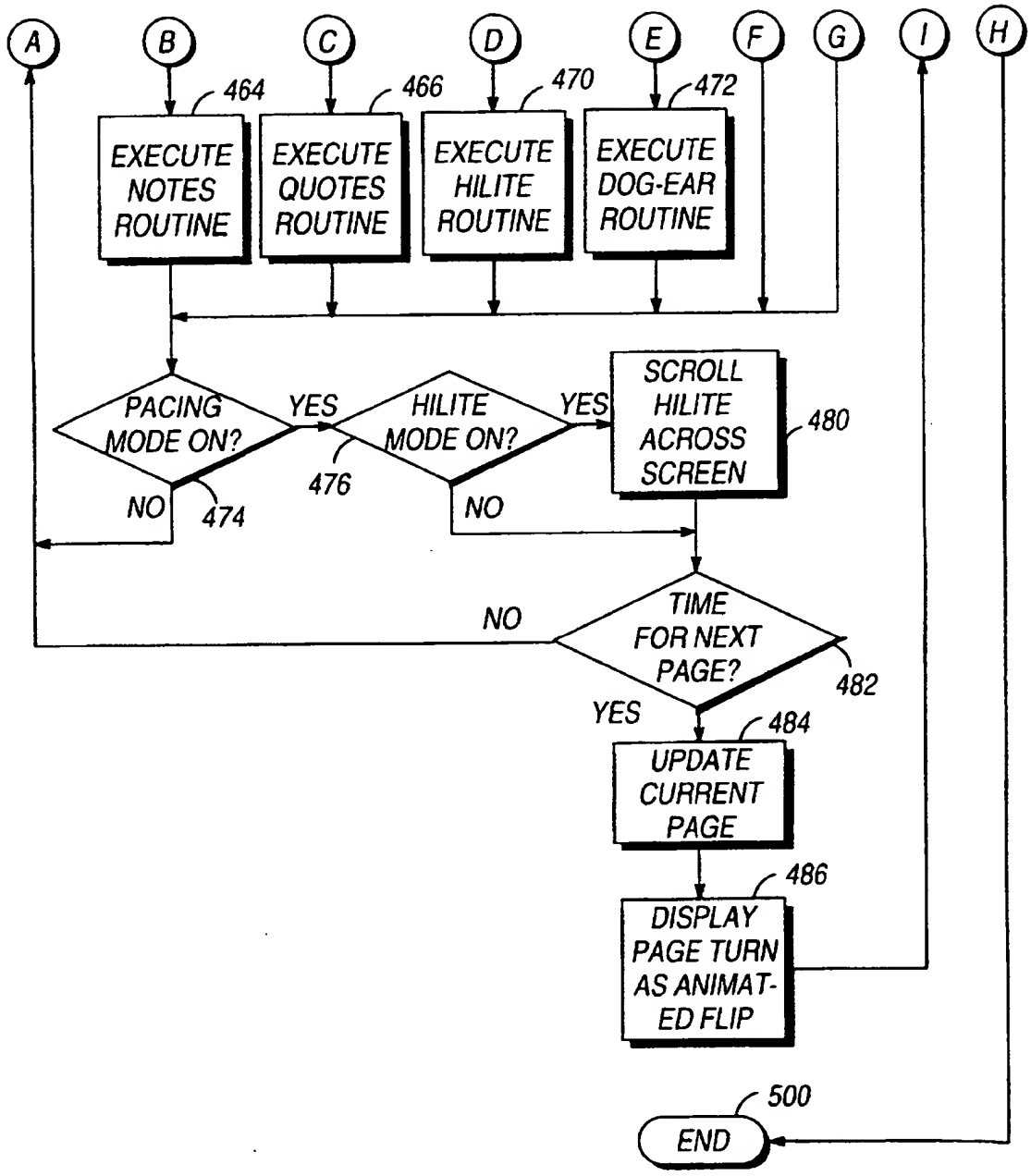
A
B
C
D
E
F
G
I
H
464
466
470
472
EXECUTE NOTES ROUTINE
EXECUTE QUOTES ROUTINE
EXECUTE HILITE ROUTINE
EXECUTE DOG-EAR ROUTINE
PACING MODE ON?
YES
HILITE MODE ON?
YES
SCROLL HILITE ACROSS SCREEN
480
NO
474
476
NO
NO
TIME FOR NEXT PAGE?
482
YES
484
UPDATE CURRENT PAGE
486
DISPLAY PAGE TURN AS ANIMAT-ED FLIP
500
END

FIG.28

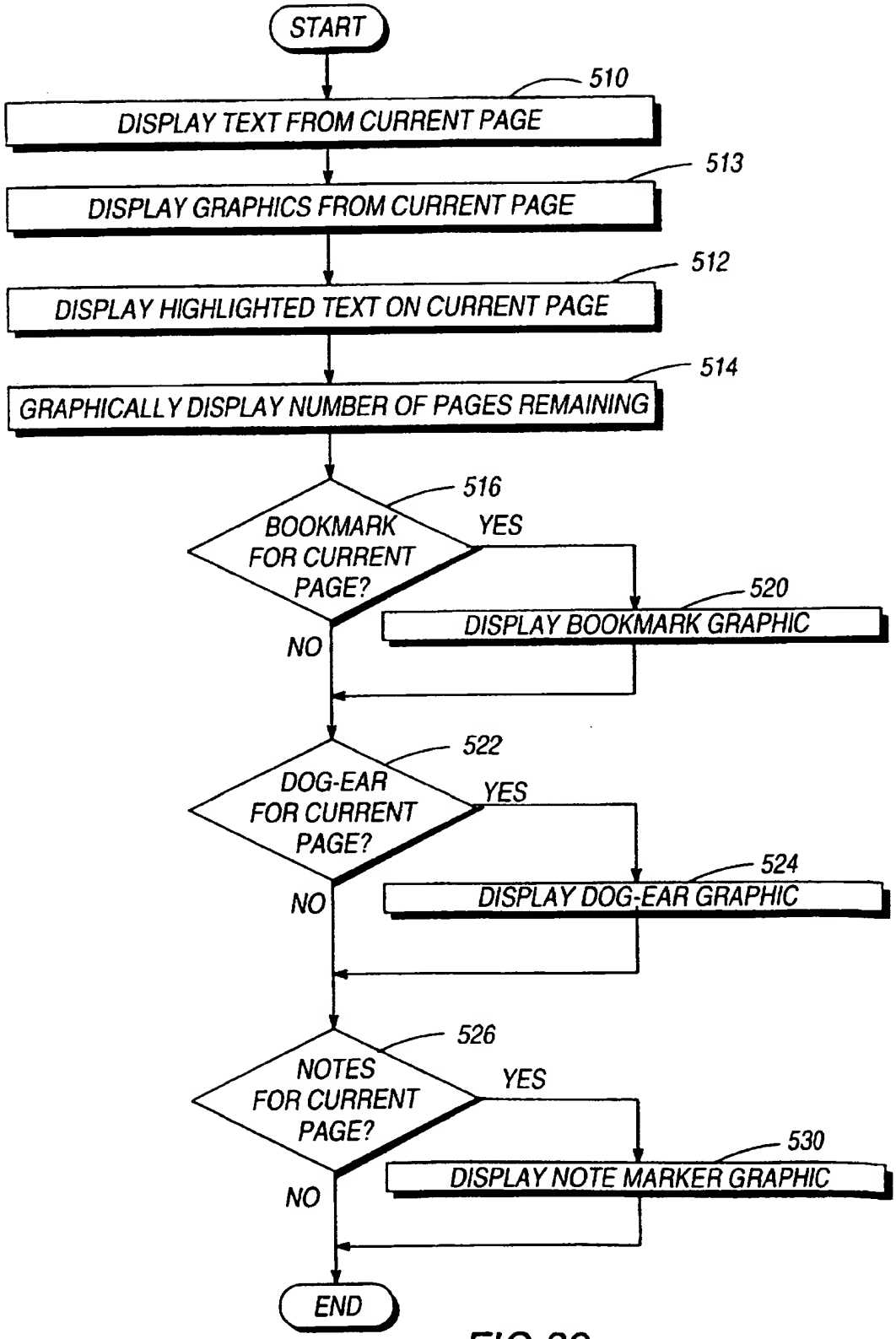
START
510
DISPLAY TEXT FROM CURRENT PAGE
513
DISPLAY GRAPHICS FROM CURRENT PAGE
512
DISPLAY HIGHLIGHTED TEXT ON CURRENT PAGE
514
GRAPHICALLY DISPLAY NUMBER OF PAGES REMAINING
516
BOOKMARK FOR CURRENT PAGE?
YES
520
DISPLAY BOOKMARK GRAPHIC
NO
522
DOG-EAR FOR CURRENT PAGE?
YES
524
DISPLAY DOG-EAR GRAPHIC
NO
526
NOTES FOR CURRENT PAGE?
YES
530
DISPLAY NOTE MARKER GRAPHIC
NO
END

FIG.29

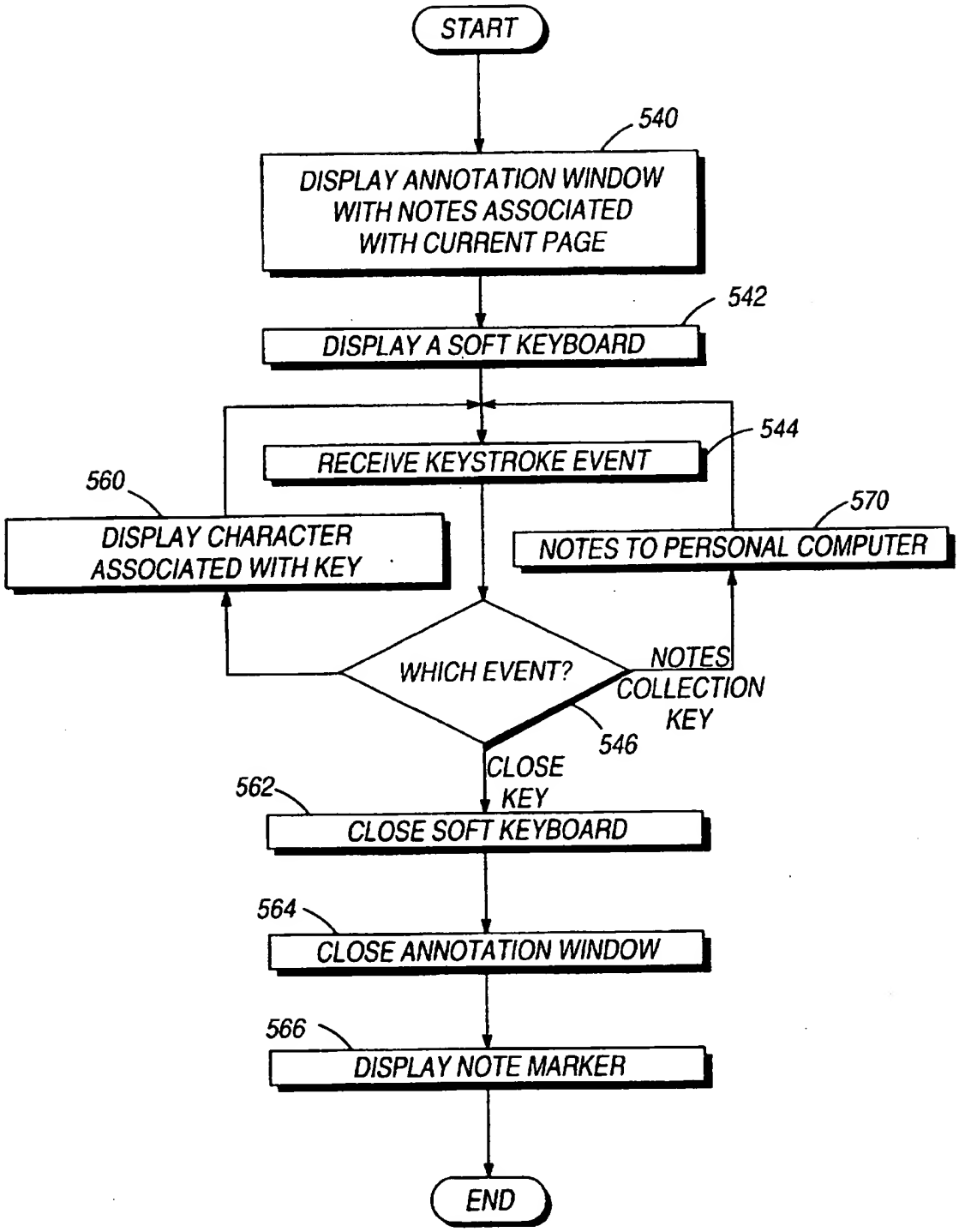
START
540
DISPLAY ANNOTATION WINDOW WITH NOTES ASSOCIATED WITH CURRENT PAGE
542
DISPLAY A SOFT KEYBOARD
544
RECEIVE KEYSTROKE EVENT
560
DISPLAY CHARACTER ASSOCIATED WITH KEY
570
NOTES TO PERSONAL COMPUTER
WHICH EVENT?
NOTES COLLECTION KEY
546
CLOSE KEY
562
CLOSE SOFT KEYBOARD
564
CLOSE ANNOTATION WINDOW
566
DISPLAY NOTE MARKER
END

FIG.30

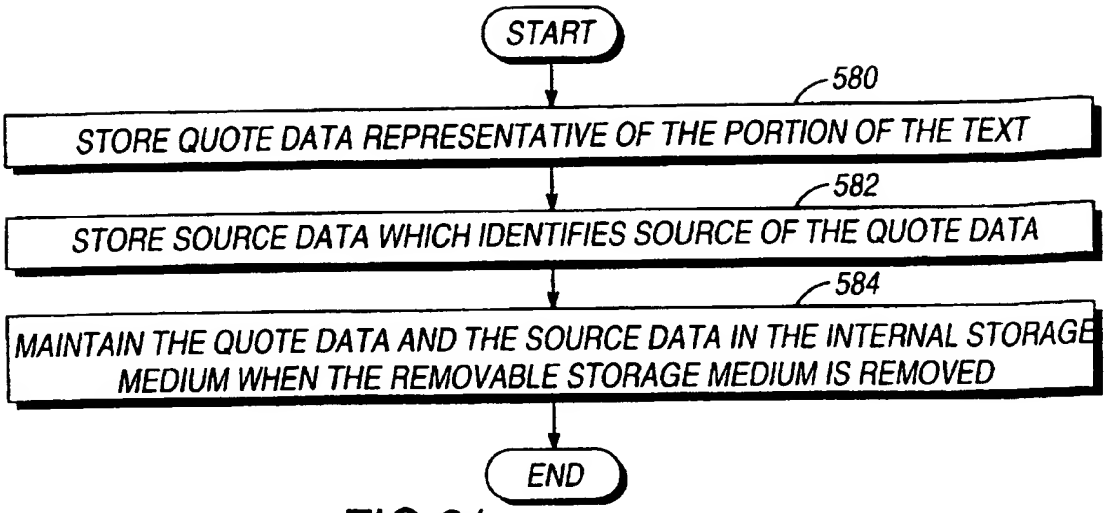
START
580
STORE QUOTE DATA REPRESENTATIVE OF THE PORTION OF THE TEXT
582
STORE SOURCE DATA WHICH IDENTIFIES SOURCE OF THE QUOTE DATA
584
MAINTAIN THE QUOTE DATA AND THE SOURCE DATA IN THE INTERNAL STORAGE MEDIUM WHEN THE REMOVABLE STORAGE MEDIUM IS REMOVED
END

FIG.31

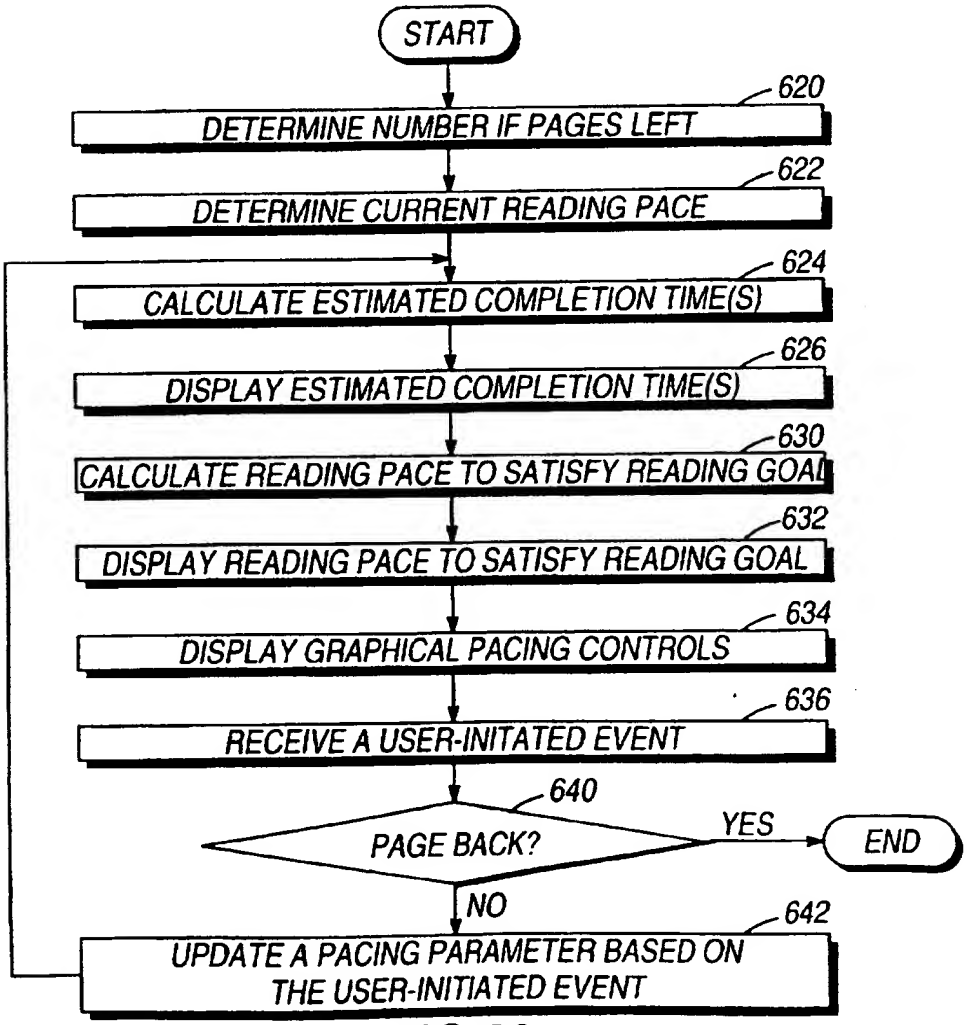
START
620
DETERMINE NUMBER IF PAGES LEFT
622
DETERMINE CURRENT READING PACE
624
CALCULATE ESTIMATED COMPLETION TIME(S)
626
DISPLAY ESTIMATED COMPLETION TIME(S)
630
CALCULATE READING PACE TO SATISFY READING GOAL
632
DISPLAY READING PACE TO SATISFY READING GOAL
634
DISPLAY GRAPHICAL PACING CONTROLS
636
RECEIVE A USER-INITATED EVENT
640
PAGE BACK?
YES
END
NO
642
UPDATE A PACING PARAMETER BASED ON THE USER-INITIATED EVENT

FIG.33

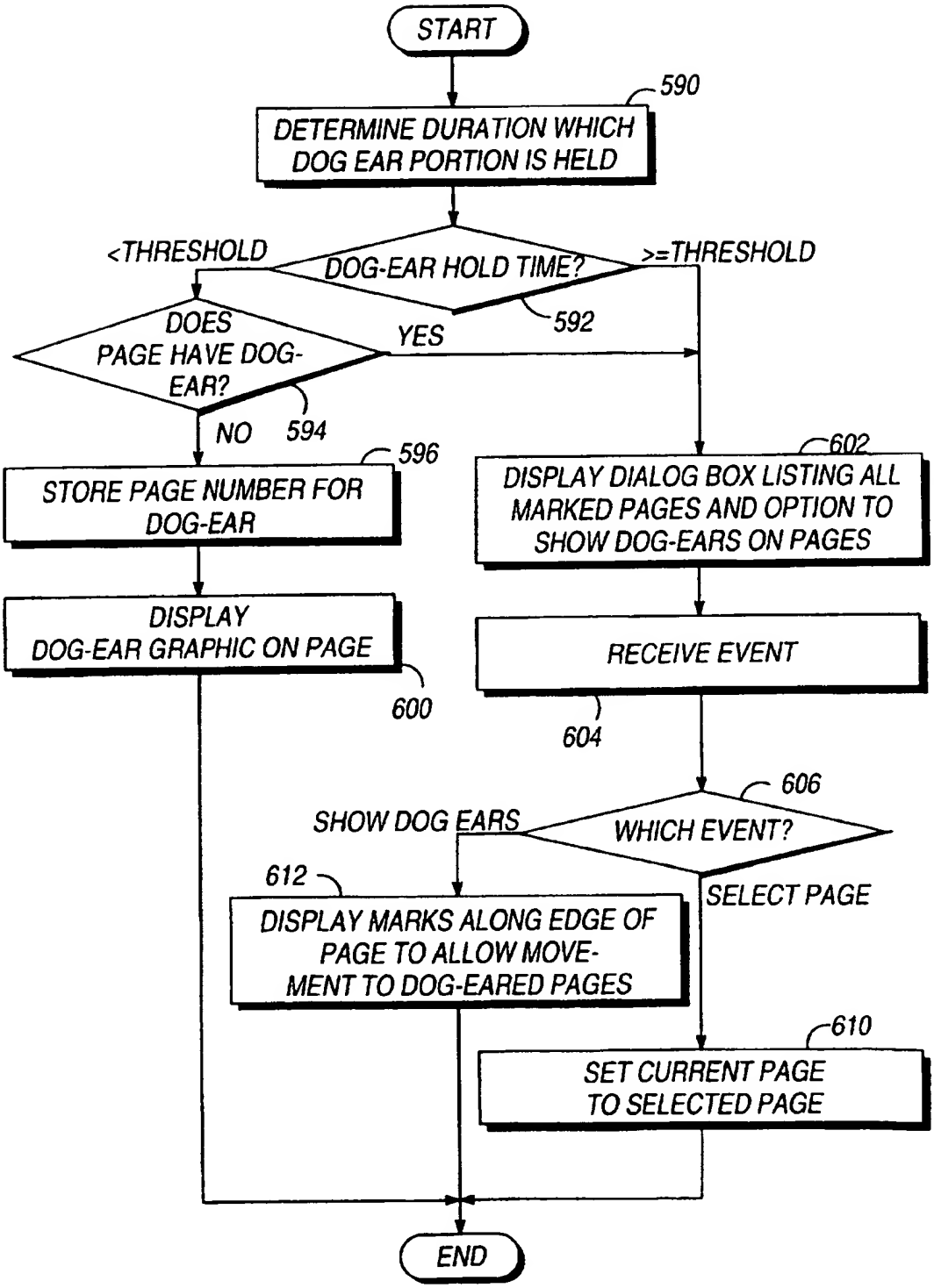
START
590
DETERMINE DURATION WHICH DOG EAR PORTION IS HELD
<THRESHOLD
DOG-EAR HOLD TIME?
>=THRESHOLD
592
DOES PAGE HAVE DOG-EAR?
YES
NO
594
596
STORE PAGE NUMBER FOR DOG-EAR
602
DISPLAY DIALOG BOX LISTING ALL MARKED PAGES AND OPTION TO SHOW DOG-EARS ON PAGES
DISPLAY DOG-EAR GRAPHIC ON PAGE
600
RECEIVE EVENT
604
606
SHOW DOG EARS
WHICH EVENT?
SELECT PAGE
612
DISPLAY MARKS ALONG EDGE OF PAGE TO ALLOW MOVE-MENT TO DOG-EARED PAGES
610
SET CURRENT PAGE TO SELECTED PAGE
END

FIG.32

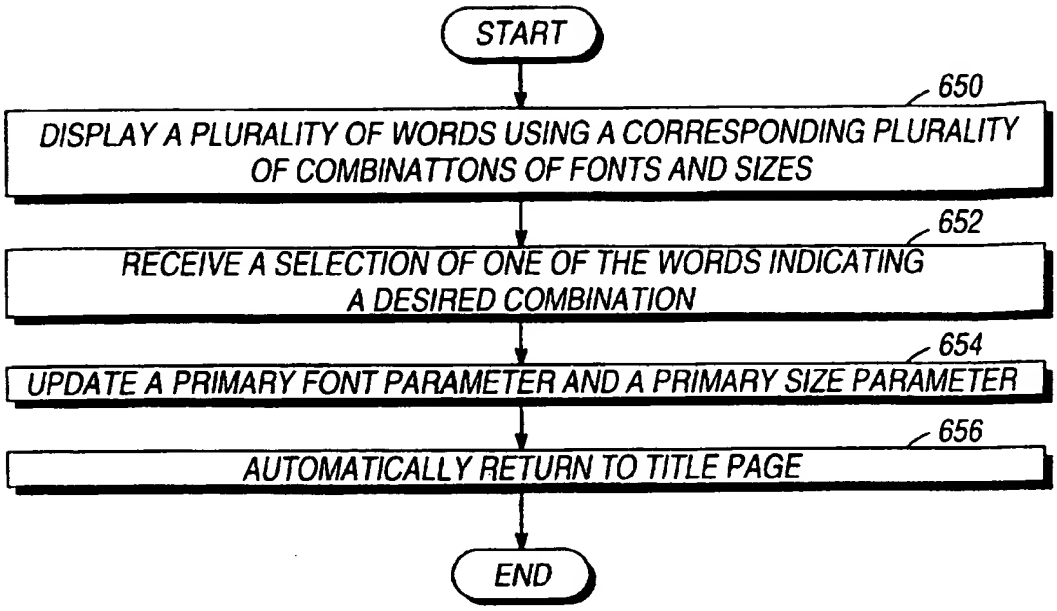
START
650
DISPLAY A PLURALITY OF WORDS USING A CORRESPONDING PLURALITY OF COMBINATTONS OF FONTS AND SIZES
652
RECEIVE A SELECTION OF ONE OF THE WORDS INDICATING A DESIRED COMBINATION
654
UPDATE A PRIMARY FONT PARAMETER AND A PRIMARY SIZE PARAMETER
656
AUTOMATICALLY RETURN TO TITLE PAGE
END

FIG.34

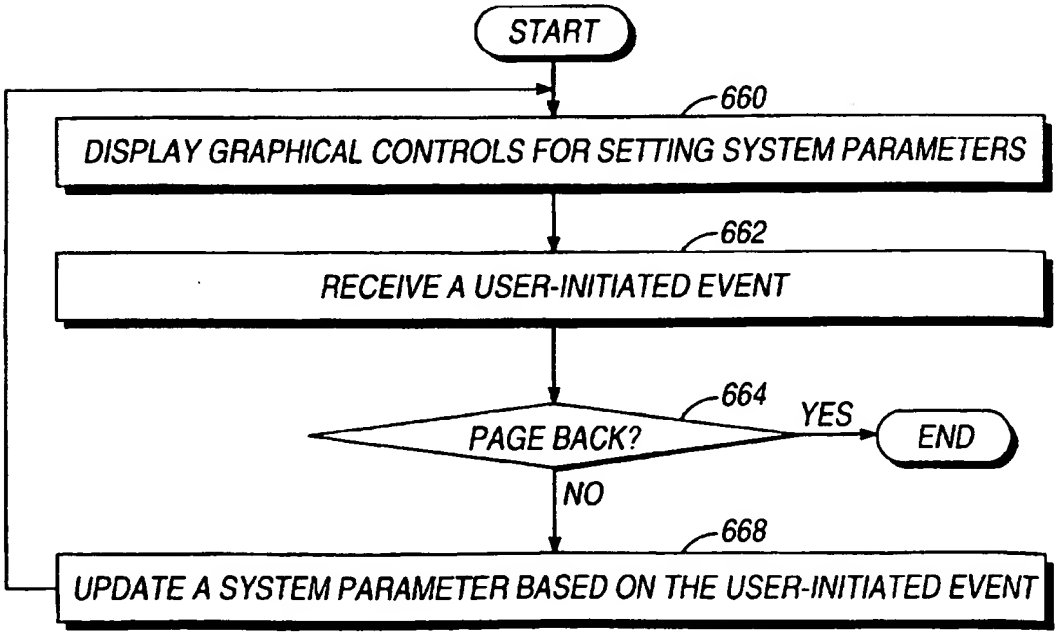
START
660
DISPLAY GRAPHICAL CONTROLS FOR SETTING SYSTEM PARAMETERS
662
RECEIVE A USER-INITIATED EVENT
664
PAGE BACK?
YES
END
NO
668
UPDATE A SYSTEM PARAMETER BASED ON THE USER-INITIATED EVENT

FIG.35

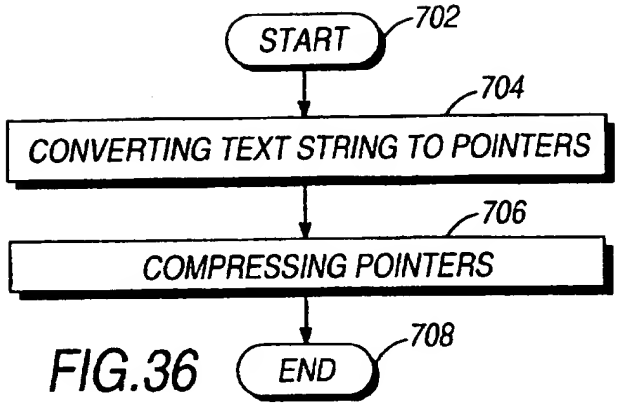
START
702
CONVERTING TEXT STRING TO POINTERS
704
COMPRESSING POINTERS
706
END
708

FIG.36

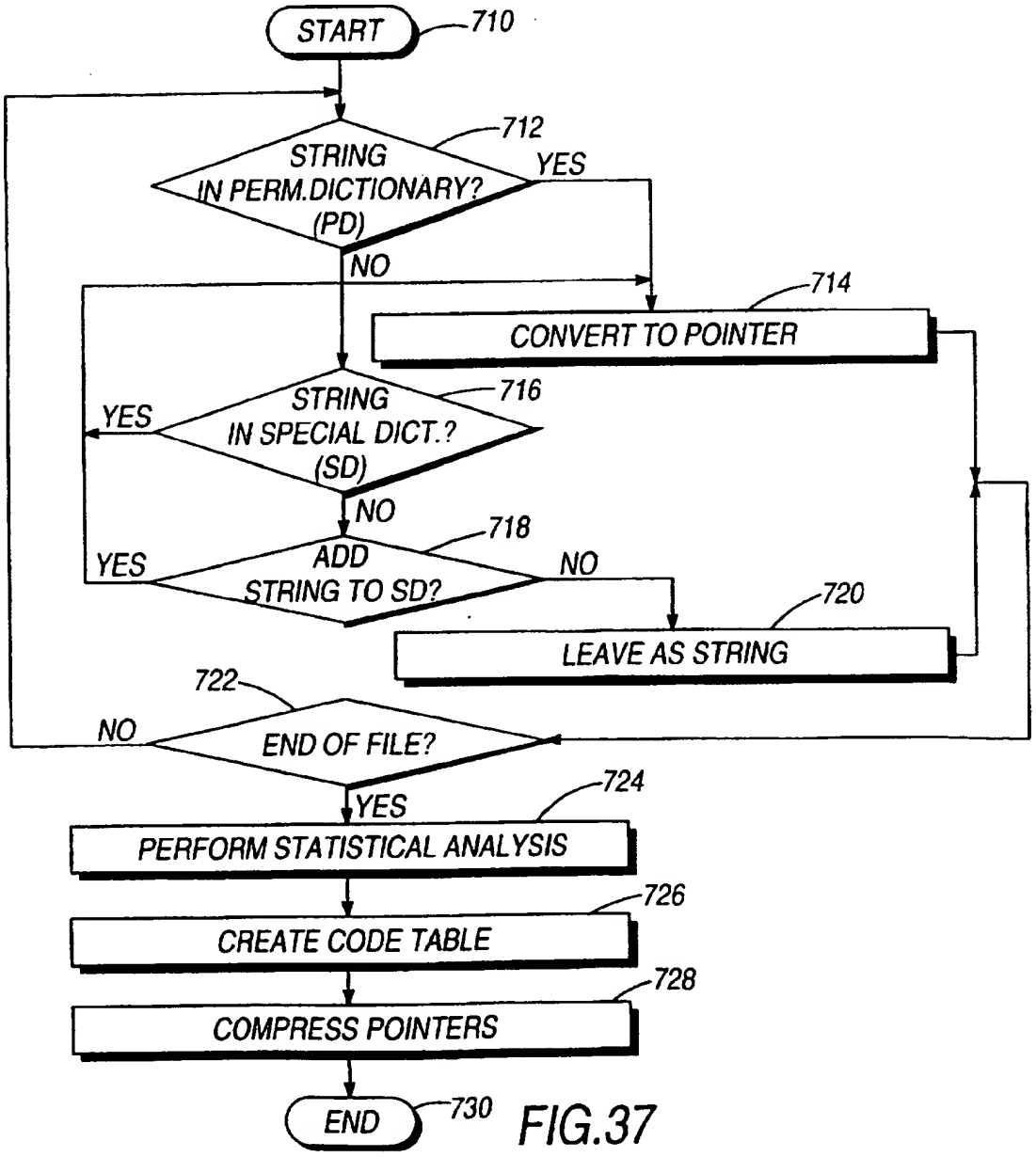
START
710
STRING IN PERM.DICTIONARY? (PD)
712
YES
NO
CONVERT TO POINTER
714
STRING IN SPECIAL DICT.? (SD)
716
YES
NO
ADD STRING TO SD?
718
YES
NO
LEAVE AS STRING
720
END OF FILE?
722
NO
YES
PERFORM STATISTICAL ANALYSIS
724
CREATE CODE TABLE
726
COMPRESS POINTERS
728
END
730

FIG.37

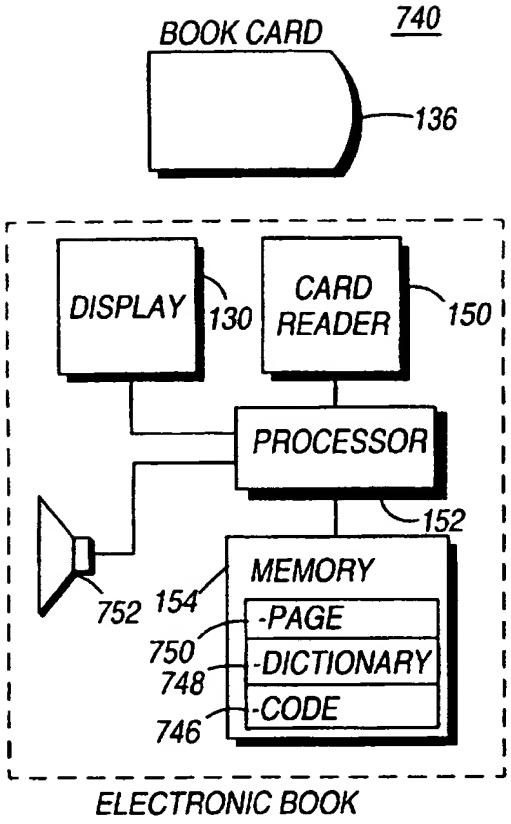

FIG.38

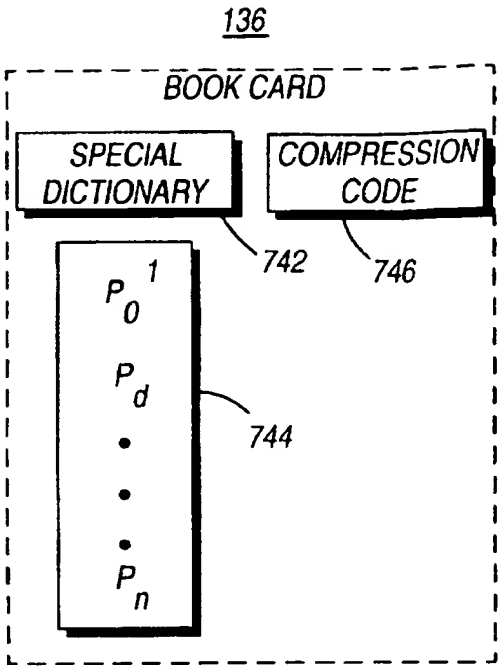

FIG.39

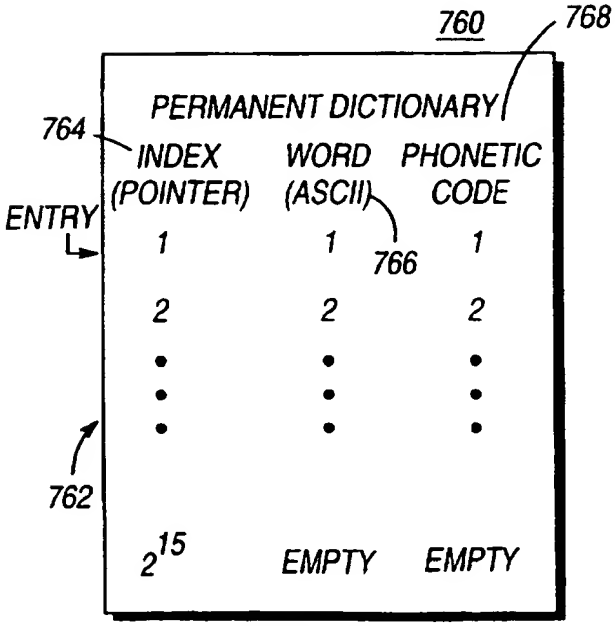

FIG.40

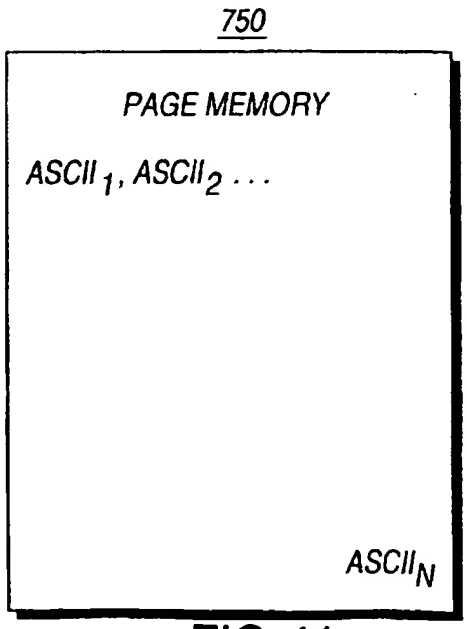

FIG.41

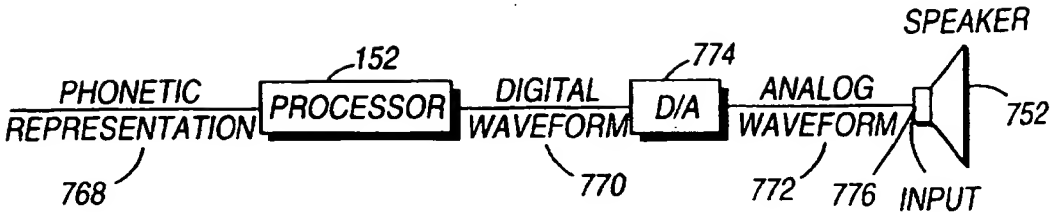
PHONETIC REPRESENTATION
768
152
PROCESSOR
DIGITAL WAVEFORM
770
774
D/A
ANALOG WAVEFORM
772
SPEAKER
752
776
INPUT

FIG.42

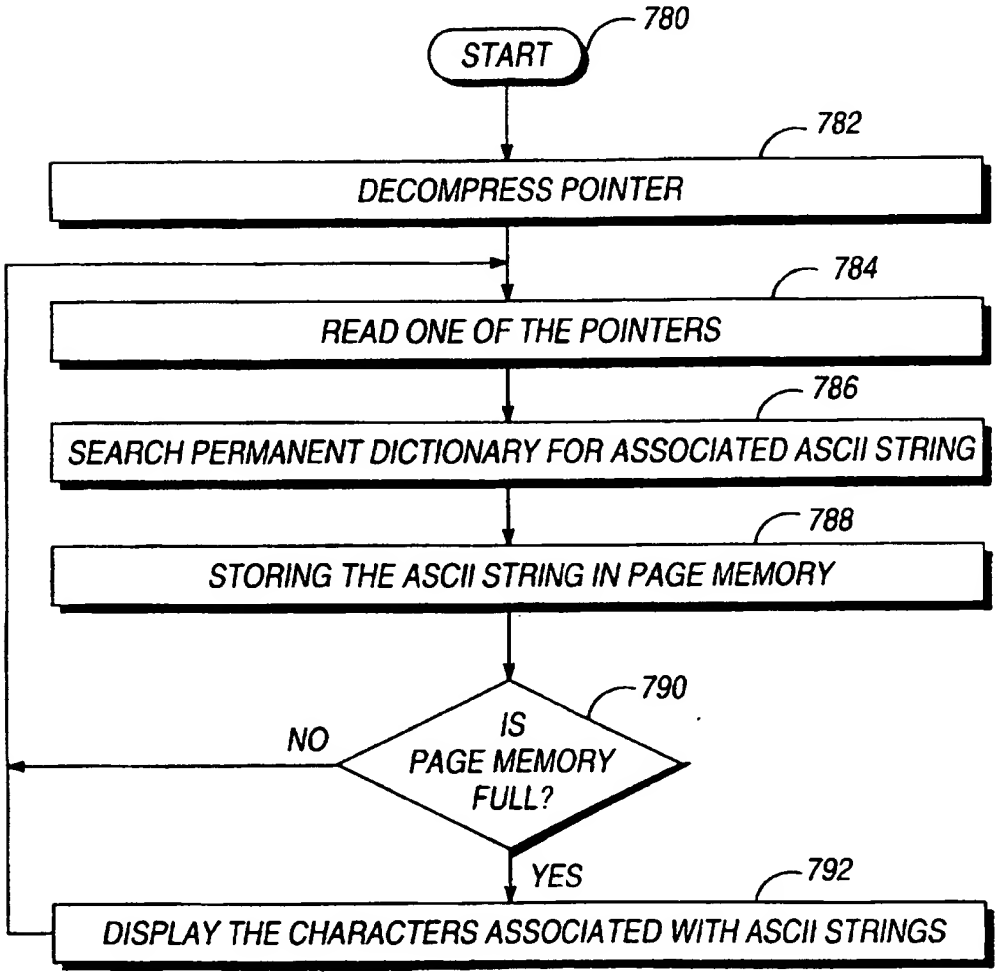
780
START
782
DECOMPRESS POINTER
784
READ ONE OF THE POINTERS
786
SEARCH PERMANENT DICTIONARY FOR ASSOCIATED ASCII STRING
788
STORING THE ASCII STRING IN PAGE MEMORY
790
IS PAGE MEMORY FULL?
NO
YES
792
DISPLAY THE CHARACTERS ASSOCIATED WITH ASCII STRINGS

FIG.43

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US96/18856

A. CLASSIFICATION OF SUBJECT MATTER
IPC(6) : G09G 5/22, 5/00, 5/24; G09B 5/00, 17/00
US CL : 345/141, 173, 192, 194; 434/178, 317
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
U.S. : 345/141, 173, 192, 194; 434/178, 317

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,437,552 A (BAER et al) 01 August 1995, columns 4-5.	1-10
Y	US 5,475,399 A (BORSUK) 12 December 1995, col.3, lines 43-56.	1-10
A,P	US 5,534,888 A (LEBBY et al) 09 July 1996, columns 2-3.	1-10

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
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Name and mailing address of the ISA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231
Facsimile No. (703) 305-3230

Authorized officer
KENT CHANG
Telephone No. (703) 305-4824

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